The Lunar Observer

A Publication of the Lunar Section of ALPO

David Teske, editor
Coordinator, Lunar Topographic Studies Section Program

January 2024

In This Issue

Online readers, click on images for hyperlinks

Lunar Reflections

Wishing each reader and contributor of *The Lunar Observer* a very Happy and Healthy 2024.

Once again, our contributors from across the globe have helped make a wonderful issue of *The Lunar Observer*. Whether it was images, drawings or articles, these submissions are all greatly appreciated. This particular issue has its Focus-On article about Sinus Iridum written by Alberto Anunziato. Contributing additional articles for this are Paul Walker, Robert H. Hays, Jr. and Rik Hill. Other studies of lunar topography include articles by Rik, Alberto and Paul, along with Guillermo Scheidereiter. As always, Tony Cook provides interesting articles about Lunar Geologic Change and Buried Basins and Craters. Many thanks to all who contributed!

Please remember to follow the future Focus-On topics and gather observations of these features. Next up is the very interesting Lacus Mortis. Observations are due to Alberto and myself by February 20, 2023.

Clear skies,
-David Teske

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Lunar Topographic Studies

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Observations Received

Name	Location and Organization	Image/Article
Alberto Anunziato	Paraná, Argentina	Article *The Topography of the Wrinkle Ridge South of Laplace A, Focus-On A Dream Landscape-Sinus Iridum*, and images of Sinus Iridum (2).
Massimo Bianchi	Milan, Italy	Images of Sinus Iridum (2).
Jean Bourgeonis	Pic du Midi observatory, altitude 2877m, Pyrénées, France	Image of Sinus Iridum
Francisco Alsina Cardinalli	Oro Verde, Argentina	Images of Sinus Iridum (2).
Jairo Chavez	Popayán, Colombia	Images of the Waxing and Waning Gibbous Moon and Sinus Iridum (2).
Maurice Collins	Palmerston North, New Zealand	Images of Plato, 8.4 day-old Moon, Clavius and Archimedes.
Massimo Dionisi	Sassari, Italy	Image of Sinus Iridum, Hyginus, Yangel' and Manilius (2).
Elias, Walter Ricardo	Oro Verde, Argentina, AEA	Images of Sinus Iridum, Plato, Kepler
István Zoltán Földvári	Budapest, Hungary	Drawings of Apianus, Messier, de la Rue and Atlas D.
Kaan Gökçeli	Istanbul, Turkey	Images of Janssen (2) and Cleomedes.
Marcelo Mojica Gundlach	Cochabamba, Bolivia	Images of Sinus Iridum (2).
Robert H. Hays, Jr.	Worth, Illinois, USA	Article and drawing *Wrinkles Near Laplace A*.
Rik Hill	Loudon Observatory, Tucson, Arizona, USA	Articles and images *Fracastorius, Sinus Iridum*
Fredrick toe Laer	J. Bresser Observatory in Borken, Germany	Image of Sinus Iridum.
Felix León	Santo Domingo, República Dominicana	Images of Sinus Iridum (2).

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

Lunar Topographic Studies

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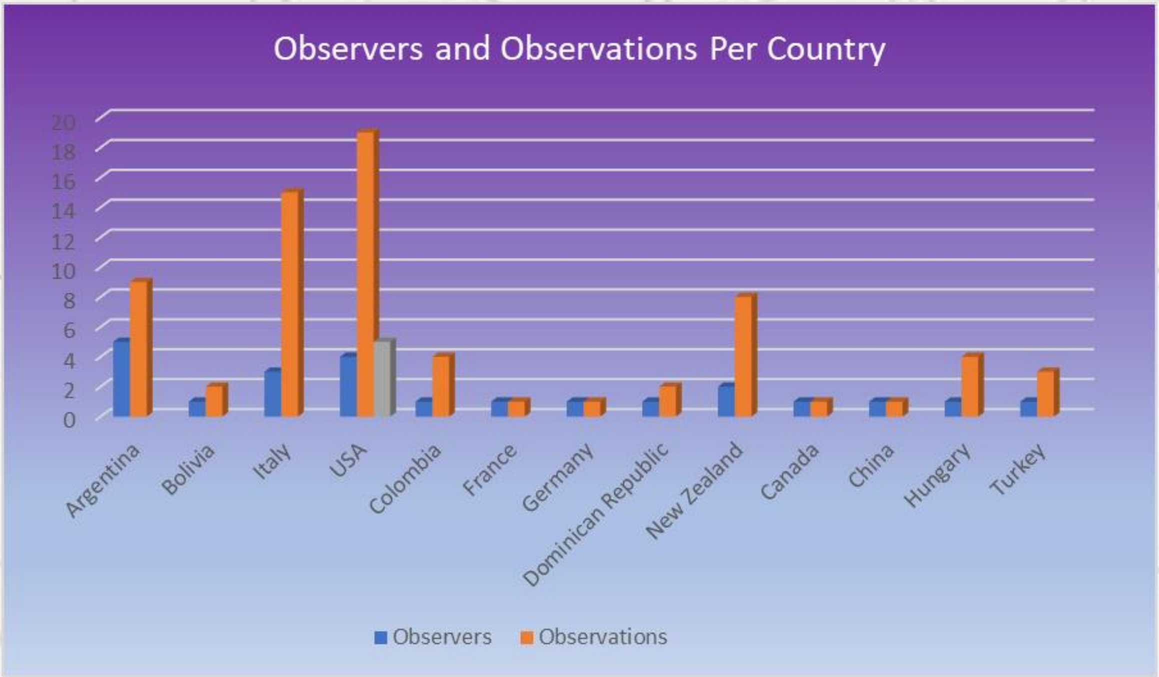
Observations Received

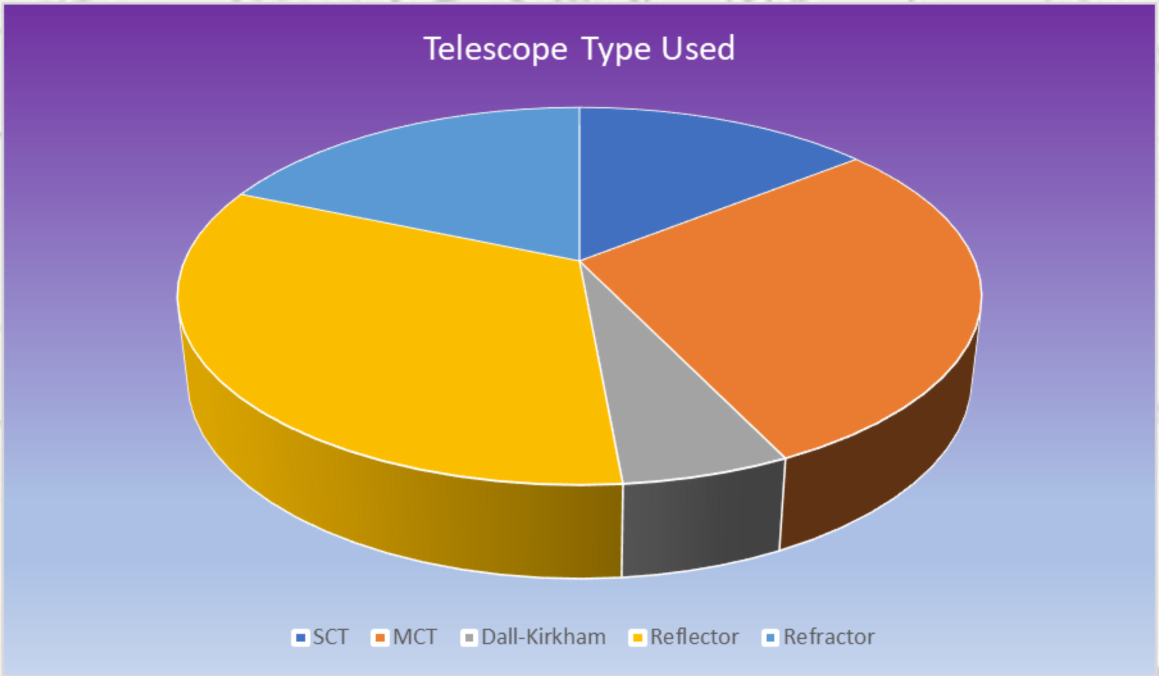
Name	Location and Organization	Image/Article
KC Pau	Hong Kong, China	Images of Sinus Iridum, Aristarchus and Licetus.
Roberto Podestá	Formosa, Argentina	Image of Sinus Iridum.
Guillermo Daniel Scheidereiter	LIADA, Rural Area, Concordia, Entre Ríos, Argentina	Article *The Moon, Variational Calculus and Chaos Theory*.
Michael Teoh	Penang Malaysia	Image of the Waxing Gibbous Moon.
David Teske	Louisville, Mississippi, USA	Images of Mare Imbrium, Plato, Pythagoras and Sinus Iridum (2).
Larry Todd	Dunedin, New Zealand	Images of Sinus Iridum (4).
Ken Vaughan	Cattle Point, Victoria, British Columbia, Canada	Image of Sinus Iridum
Fabio Verza	Milan, Italy, SNdR	Images of Atlas, Theophilus, Endymion, Aristoteles, Clavius, Copernicus, Plato and Ramsden.
Paul Walker	Middlebury, Vermont, USA	Articles and images *Far Western Mare Frigoris, Sinus Iridum and Northwest Mare Imbrium, Oceanus Procellarum and Volcanic Domes Near Marius, Oceanus Procellarum, Vallis Schröteri and Aristarchus, Mare Humorum, Gassendi* and *Lacus Excellentiae and Oceanus Procellarum, Hansteen and Billy.*

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

January 2024 *The Lunar Observer*
By the Numbers

This month there were 70 observations by 23 contributors in 13 countries.





Oceanus Procellarum, Hansteen and Billy, 2023-11-25 02:36 UT

Paul Walker

This covers part of southern Oceanus Procellarum. I wouldn't be surprised if there are some lunar domes in here somewhere but I didn't see any off hand in the Virtual Moon Atlas (VMA). There are plenty of wrinkle ridges.

There are also number of ghost craters. Some more ghostly than others, some named, some not. On the right-hand side, just above the center is Flamsteed P. It's 100 km (61 mi) across with the east side fairly well defined but only a couple short sections of the rim showing on the west side. The much smaller crater, Flamsteed, is in the bottom of it, just inside the rim. Flamsteed has a clearly irregular rim.

In the center of the image is Flamsteed G at 46 km (27 mi). The east wall here is also well defined. To the west is what looks like something that could be the mostly buried west rim but considering the fore shorting of the other craters in the area is more likely wrinkle ridges. The linear feature where the middle of the crater should be could be the top of a central peak but it seems to be the too long. Ha, looking back and forth between this image and the VMA I realize it's not the center of the crater, it's a bit of what is the actual west rim. Above Flamsteed G is Flamsteed T (24 km) which may be too clear to be called a ghost crater. Just south of Flamsteed G is what sure looks to me like another ghost crater with only a partial east rim showing. This is not named on the VMA.

Shifting your gaze to the left and down a little, you come upon another sizable ghost, 72 km (42 mi) Sirsalis E. It's west wall and a small section of the east is visible. Based on the image, I would say 2 bits of a central peak are visible but that is apparently due to a lack of resolution, as on the VMA I see 2 craters in the same locations. A little to the east is a much smaller unnamed (according to VMA) ghost crater of ~16 km diameter. It appears as small left and right apprentices.

On the east side toward the bottom, we find Letronne, a 119 km (72 mi) ghost crater. The 3 dots in the middle are probably what's left of its central peak. The bright spot just to the upper right of that is a small crater and its bright ejecta blanket.

Near the bottom there are 2 obvious craters of about 45 km (27 mi) diameter, Hansteen (upper) and Billy. Though they are almost exactly the same size and formed between 3.2 and 3.8 billion years ago, their floors couldn't be more different. Hansteen has as very eroded and convoluted floor with a central peak while Billy has a smooth, lava filled, floor and no central peak.

I have been concentrating on craters, especially the ghostly one but I noticed on the VMA a named feature above Billy and to the lower right of Hansteen, Mons Hansteen. This is somewhat triangular shaped feature that is notably brighter than its surroundings. I'll have to try to remember to look for this feature. It should be quite obvious at Full Moon. To find it go to the bottom of Oceanus Procellarum and look for a smallish dark oval with a bright rim (Billy crater). Mons Hansteen is the bright triangle just north of it, pointing north. Based on the size I would recommend using 150x or more for a good view.

Oceanus Procellarum Hansteen and Billy, *Paul Walker, Middlebury, Vermont, USA. 2023 November 25 02:36 UT, colongitude 57.5º. 10 inch f/5.6 Newtonian reflector telescope, 2x barlow, fl 3,946 mm. Canon T7i camera.*

Lunar Topographic Studies
Oceanus Procellarum, Hansteen and Billy

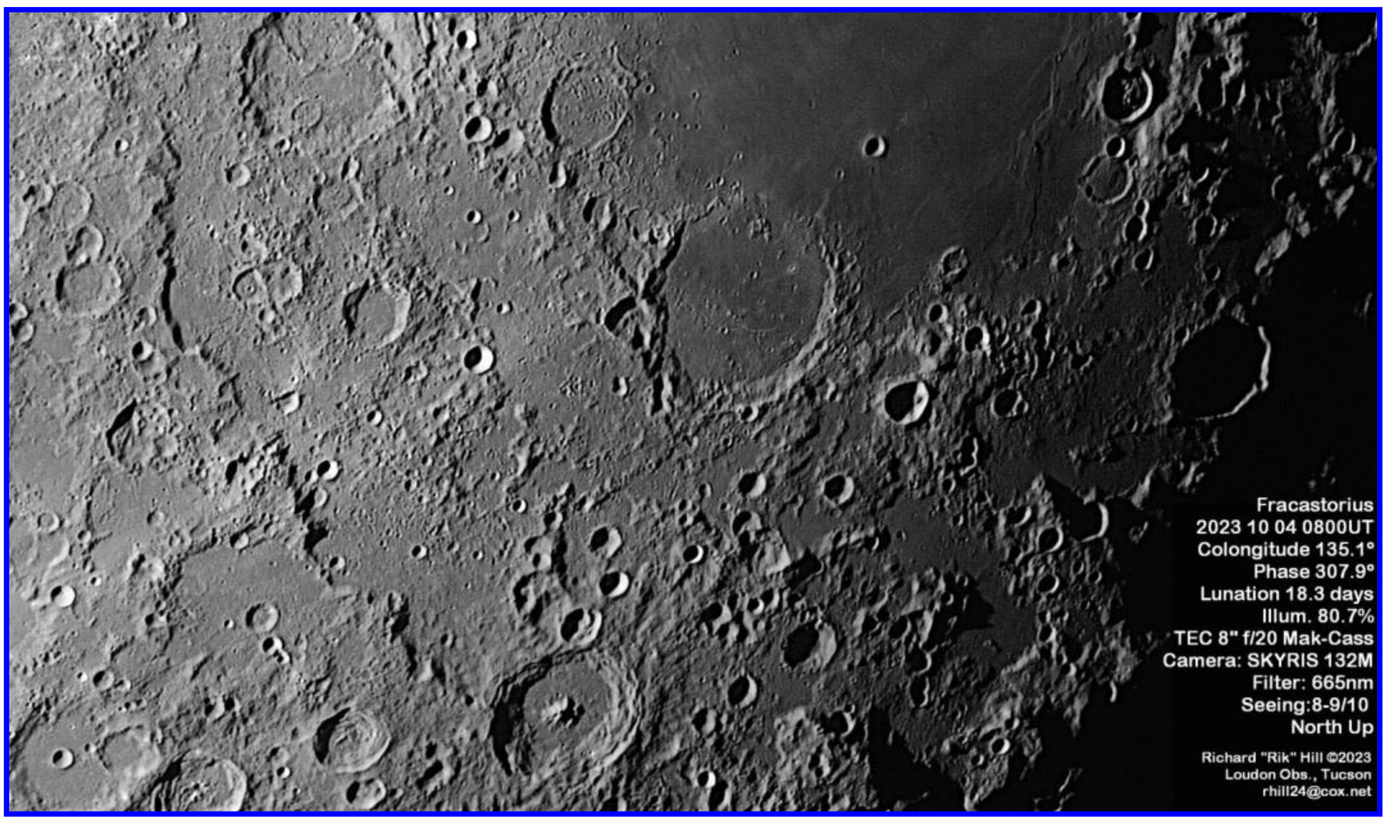
Fracastorius

Rik Hill

On the south shore of Mare Nectaris can be found a number of lunar treasures to occupy and evening of pleasant observing. The first thing a newcomer might notice is the great "U" shaped feature that is Fracastorius (128 km dia.). If your telescope is large enough, magnification high enough and the lighting right, you will notice a faint smile on the floor of this partially submerged crater, a rima with a bend in the middle. There is more to the rima than seen here but you will need a good-sized telescope and just the right lighting to see it all. On the south shore of Fracastorius is a curious feature called Fracastorius Y. Prior to spacecraft, this was the subject of much speculation as to its nature. Today we can see in LROC Quick Map that it is the merge of 3 craters with post-impact modification. In fact, from this feature up to the crater just north of it, Fracastorius D on the east (left) side of Fracastorius, there are a lot of curious forms. To the upper left from Fracastorius can be seen a smaller version of this crater, Beaumont (54 km). Both craters are flooded with their north walls breached by magma from the Nectaris impact some 3.8-3.9 billion years ago.

Moving south across this rugged landscape (selenoscape?) we come to a notable crater near the bottom of this image, Piccolomini (90 km) with beautifully terraced walls save on the south side where there was apparently a collapse. Notice that it sits at the south end of a scarp, the outer wall of the M. Nectaris impact, called Rupes Altai. It is an impressive 495 km long cliff that runs from Piccolomini north to just west of the crater Catharina (104 km).

There are many other features to explore in this region like the hoof-print crater north of Piccolomini, or the two craters that share a straight wall between them just south of Catharina, or the interesting ejecta cluttered floor of Pons. (I'll let you find that last one for yourself!)



Fracastorius, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2023 October 04 08:00 UT, colongitude 135.1°. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 665 nm filter, SKYRIS 132M camera. Seeing 8-9/10.*

Lunar Topographic Studies
Fracastorius

The Topography of the Wrinkle Ridge South of Laplace A

Alberto Anunziato

In this edition of "The Lunar Observer" the Focus-On Section was dedicated to Sinus Iridum. Among the great images of our collaborators, there is one in which the structure of the most prominent wrinkle ridge in the area is seen in great detail, which runs on the imaginary line that joins Promontorium Laplace and Promontorium Heraclides and has no name. We found it interesting to attempt a description of the aforementioned elevation and thus try to simplify its complex structure in order to maximize future observations. The image belongs to Kwok C. Pau, to whom we thank, and was included in the aforementioned Focus-On Section on Sinus Iridum of this edition. IMAGE 1 is the original image, Promontorium Laplace is the elevation seen in the upper left corner. We start from that point at the top of IMAGE 1, which would be from the northeast. For the analysis we propose we have expanded IMAGE 1 and segmented the wrinkle ridge into segments. Segment 1 begins near Promontorium Laplace and ends just below Laplace A.

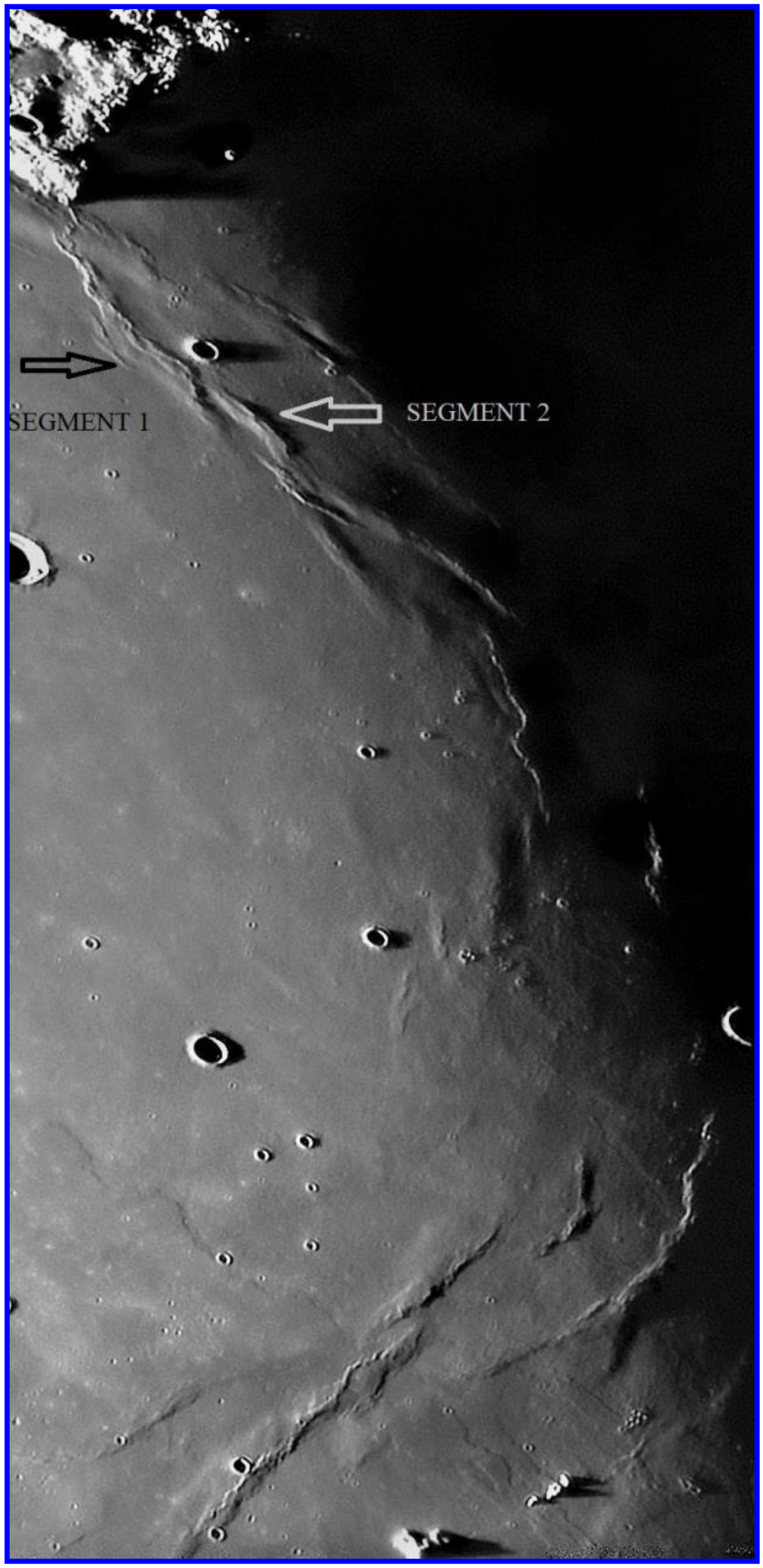


Image 1, Wrinkle Ridge South of Laplace A, *KC Pau, Hong Kong, China. 2022 April 11 12:11. 10 inch f/6 Newtonian reflector telescope, 2.5x barlow, QHY-CCD290M camera.*

We begin point 1 of IMAGE 2. Above the widest and lowest component (called the arch) runs the upper, narrower and steeper component (called the crest). In this first segment the crest runs along one of the margins, changing margins twice. This is one of the characteristic arrangements of the crest over an arch, the other being the echelon structure (which does not appear on this particular ridge). IMAGE 2 is a detail of the northern half of segment 1. Arrow 2 shows the main ridge on the east margin of the arch, while arrow 3 shows a secondary ridge, parallel to the main one, and between both heights there appears to run a defile. Point 4 marks a point where the slope of the arc practically disappears. Point 5 marks a separation point, where a secondary crest runs on a parallel segment, best seen in IMAGE 3. Point 5 also marks the change of the crest from the east margin to the west margin of the arch.

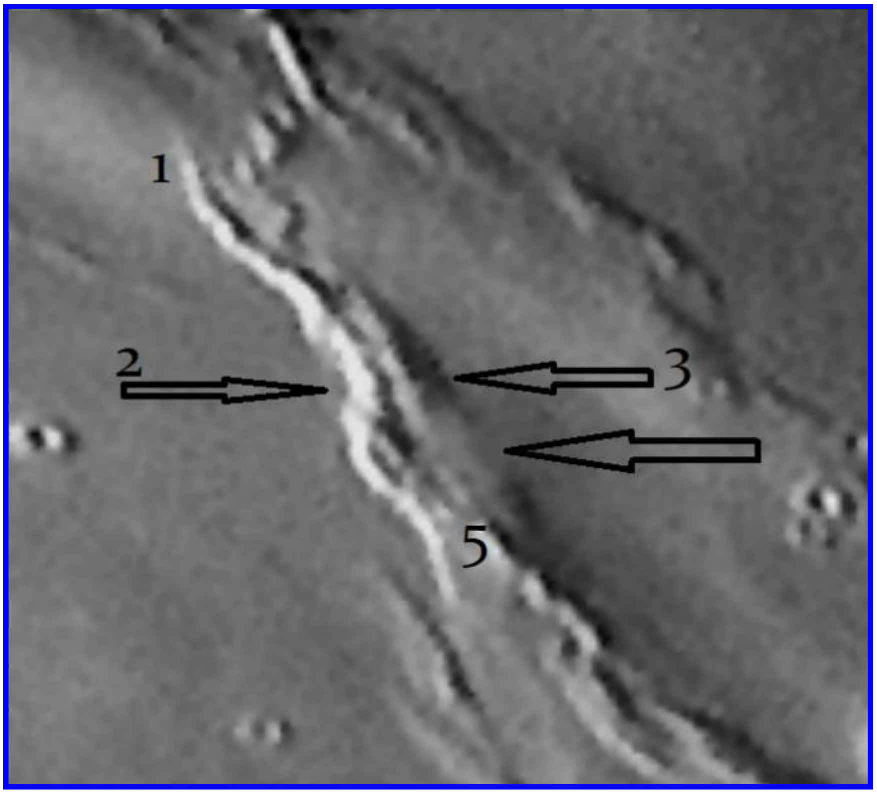
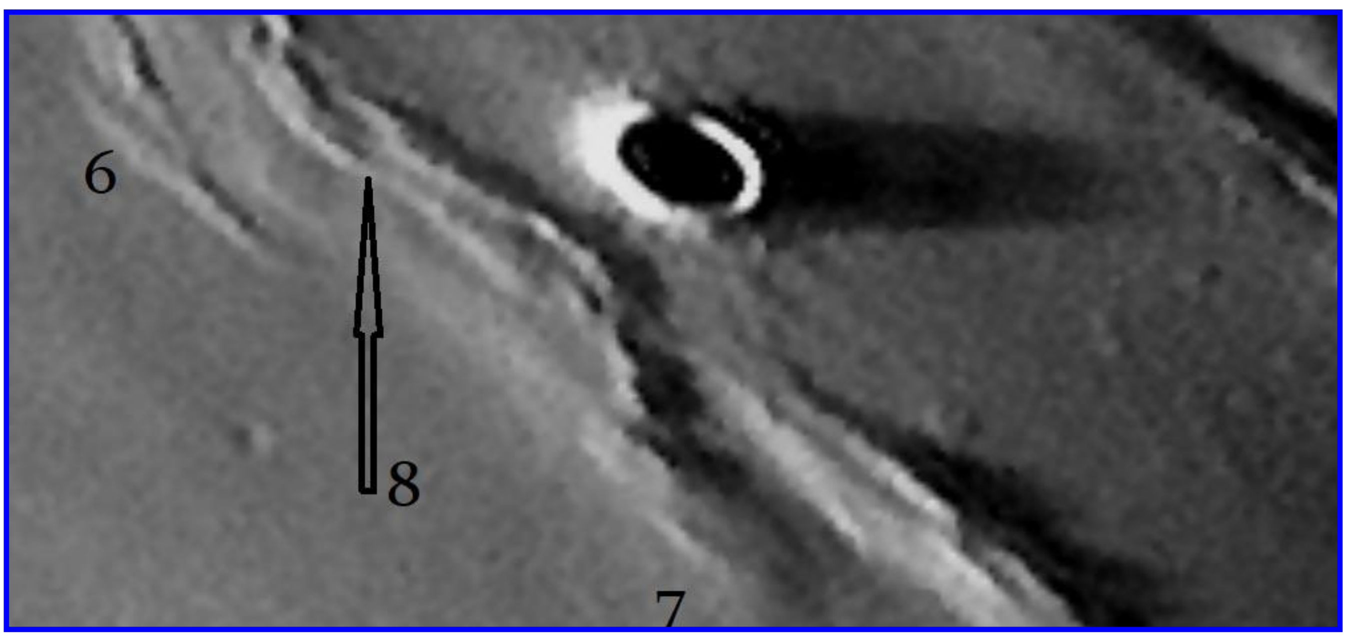


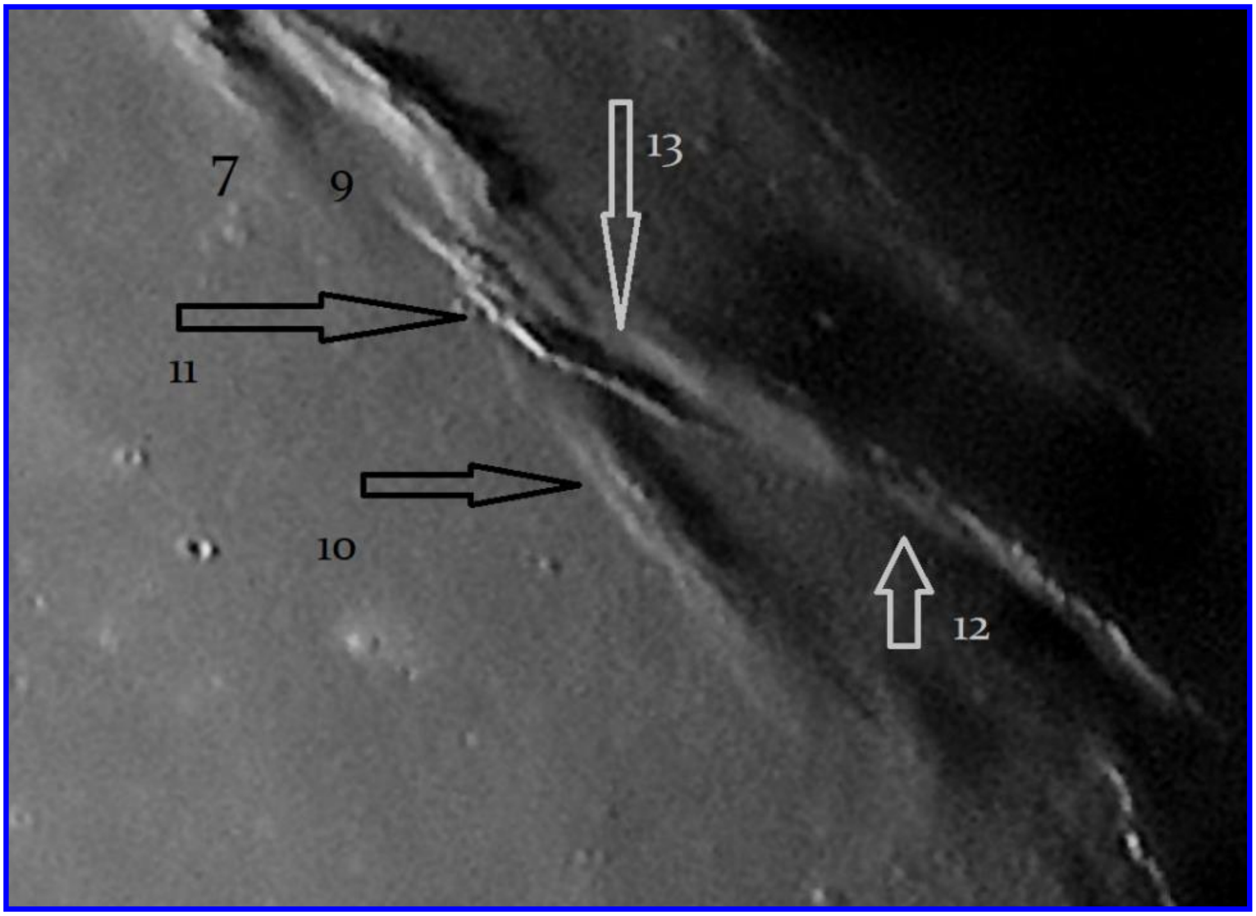
Image 2 (eft) and Image 3 (below), Wrinkle Ridge South of Laplace A, *KC Pau, Hong Kong, China. 2022 April 11 12:11. 10 inch f/6 Newtonian reflector telescope, 2.5x barlow, QHY-CCD290M camera. Close-up of image 1.*

We are now on IMAGE 3. Point 6 marks the segment parallel to Segment 1 and a broken crest. The crest continues along the eastern margin and, passing Laplace A, it migrates again and loses height, as does the arch on which it sits, which seems to end at point 7. Arrow 8 points towards an area where there is a series of heights above the arch, the one closest to the crest almost looks like a secondary crest. We could mark point 7 as the end of segment 1.



Now we move on to segment 2 in IMAGE 4. We mark point 7 again, the end of segment 1. Segment 2 begins at the far left of the image. The first thing we point out is an anomalous characteristic of the arch: it does not seem to have a gentle slope, but rather both appear very steep. Point 9 marks a very smooth area, the eastern margin of the arch is very steep, the crest passes through the opposite margin and seems to be interrupted at the site where there would be a secondary crest (or rather it is the same crest that briefly migrates from one margin to another). Arrow 10 marks what could be the end of segment 2, although it could also be a fork and it could be understood that segment 2 continues to the right. The strangest thing about this dorsum is undoubtedly this crest (arrow 11), which crosses both segments almost transversely. The most plausible explanation, especially looking at the full picture of IMAGE 1, is that arrow 10 marks a secondary arch (with a small crest) and that the crest marked by arrow 11 is the crest of the upper half that migrates from the west margin to the east margin, although there is an evident discontinuity. In this way, the crest of the segment would migrate again towards the other margin of the arch more or less where arrow 12 is. Now, arrow 13 indicates an intermediate zone between what would be the main crest, which seems to run along the gentlest slope. of the arch (another anomaly), and the other margin of the arch, and even what could be considered a secondary crest.

Image 4, Wrinkle Ridge South of Laplace A, *KC Pau, Hong Kong, China. 2022 April 11 12:11. 10 inch f/6 Newtonian reflector telescope, 2.5x barlow, QHY-CCD290M camera. Close-up of image 1.*



This is an example of how complex the structure of the wrinkle ridge is, at least those that are not very small. In the theoretical literature the model is that of two components: an arch with a gentle slope and an abrupt one and a crest that generally migrates from one edge of the arch to the other; while in reality we have arches with a very complex structure, with different heights, depressions inside, gentle and steep slopes alternating on the same margin, parallel segments; and the crests are usually multiple, parallel and even outside the arch. A challenge would be to generate a more complex topography that is closer to what these complex structures are like.

Oceanus Procellarum and Volcanic Domes Next to Marius
2023-11-25, 02:24 UT

Paul Walker

This whole area is part of Oceanus Procellarum, the lower central portion.

On the left side about 2/3 way up from the bottom you will see a whole lot of bumps. These are not normal hills or mountains. Most are lunar domes, volcanic domes on the Moon. In this case mostly shield volcanoes where lava flowed onto the surface and spread out.

These are easy to see in small telescopes a day or two before a Full Moon. Marius is the large crater just to the right of them. There are at least 23 domes named after this crater, labeled Marius 1 through Marius 23 on the Virtual Moon Atlas. With at least 29 others with labels referencing other small craters in the area. Such as Marius A 1 and Marius Z 1. Many of these have calderas (volcanic craters) on them but this image does not have enough resolution to show them. However, if you look in the upper right corner you will spot a dome with a little depression (a caldera) on top of it. That is another shield volcano. named Herodotus Omega and is about 10 km (6 mi) across.

Just to the upper right of the domes is a squiggly line. This is Rima Marius, a volcanic channel 2 km (1 mi) wide and 250 km (151 mi) long.

Don't forget to check out the wrinkle ridges, there are lots of them all the way from the top to the bottom of the image.

Oceanus Procellarum and Volcanic Domes Next to Marius, *Paul Walker, Middlebury, Vermont, USA. 2023 November 25 02:24 UT, colongitude 57.4°. 10 inch f/5.6 Newtonian reflector telescope, 2x barlow, fl 3,946 mm. Canon T7i camera.*

Oceanus Procellarum, Vallis Schröteri and Aristarchus

Paul Walker

This whole area is part of Oceanus Procellarum, the upper central portion. At the very top edge just coming into view on the terminator, is Mon Rümker, a 70 km (42 mi) complex of volcanic domes. It was the July 2023 Focus-On feature.

On the left side about 1/3 the way up is a is a large rough area with what looks like a river running through it. That whole area is a large volcanic dome complex. The "river" is a volcanic channel called Vallis Schröteri (Schröter's Valley), a very popular feature for many lunar observers. This large dome or rise has many small volcanic domes scattered across it and a few small volcanic channels. There are other volcanic channels nearby on the right-hand side; see how many you can spot. This is not the best image of this area so only a few are visible. Vallis Schröteri is easy to see in a small scope even at Full Moon, the small channels require the right lighting, steady air and probably a 8" or larger scope. Note- the contrast is much higher here than in a telescope and visually the smallest features visible here require very steady seeing and a large telescope.

The prominent crater at the bottom right of the rise is Aristarchus (40 km, 24 mi). This is a young crater (less than 1 billion years old). To its left is the older Herodotus (35 km, 21 mi) and between 3.2 and 3.8 billion years old. To Aristarchus upper right is a mostly filled in crater, Prinz (48 km, 29 mi), which is between 3.8 and 3.85 billion years old. At about the 1 o'clock position is the starting point of the channel Rima Prinz I.

If you look in the lower left corner you will spot a dome with a little depression on top of it. That is another shield volcano named Herodotus Omega and is 10 km (6 mi) across.

Don't forget to check out the wrinkle ridges, there are lots of them all the way from the top to the bottom of the image.

Oceanus Procellarum Vallis Schröteri and Aristarchus, *Paul Walker, Middlebury, Vermont, USA. 2023 November 25 02:17 UT, colongitude 57.3°. 10 inch f/5.6 Newtonian reflector telescope, 2x barlow, fl 3,946 mm. Canon T7i camera.*

The Moon, Variational Calculus and Chaos Theory

Gullerimo Scheidereiter

The Moon... always the Moon...

When I did my degree in mathematics in the city of Buenos Aires, I had the opportunity to attend a seminar on Variational Calculus given by a well-known British professor who, from now on, I will call Dr. J.O. who was invited by the university in accordance with a conference he came to Argentina to give at an international congress which was held in Buenos Aires. He was a bald man, with a very jovial attitude (such was my surprise when I found out that he was much older than I thought), with a lively and inquisitive look. His Spanish was not good and his classes ran in a mixture of English and Spanish, but in any case the chalk strokes glided across the blackboard like skates on ice. The first class, with only a brief introduction, more historical than formal, posed the problem of the brachistochrone, proposed in 1696 by Johan Bernoulli, which consists of determining the plane curve along which a point mass slides from one given point to another, in such a way that the time invested in traversing it is minimal. Dear reader, I will not overwhelm you with tedious formulas, but let me tell you that that morning I fell asleep and arrived around the start time of the class and my classmates, in an act of mischief, occupied the best seats in the classroom, leaving a seat free only, exactly in front of the teacher, where I had to sit.

For a few minutes he walked like a caged lion, from one side of the classroom to the other, giving us time to solve the problem. I was very young and shy and didn't enjoy being so exposed, but the joke of my friends left me on a platter for the inquisitive look of the professor. So, to my utter regret, he pointed his finger at me and told me to display my work on the board. I could not believe it!! "Darn," I thought. To the low laughter of my classmates, I began to write my timid calculations on the intimidating green chalkboard. My hands were sweating and the chalk was moistening. Time seemed to stand still, and for a moment I imagined the frictional force between the chalk and the blackboard as the infinite pulse of Dirac's delta. Mysteriously, my heart was beating in my stomach instead of beating in its usual position, which made me very uncomfortable. With great energy in his voice and, as I told him before, in a mixture of English and Spanish, the teacher ordered me to also explain my scribblings while I was writing. Again, I thought, "Darn, it can't be!!" But, to my own surprise, I began to talk and write about infinitesimal variations of arcs, an integral here, some derived there, in a moment of enlightenment I resorted to the principle of conservation of energy and, before the astonished and silent gaze of my companions, I arrived at a wonderful functional and the problem was solved. Dr. J.O. said, "Well done." As I walked ungainly to my lonely seat, I gave the rest of my class my best look of triumph and prepared to enjoy the lecture.

Towards the end of the seminar, which lasted a few days of intense activity, the professor. J.O. He said goodbye to us and went to a farewell ceremony that the authorities of the University's Mathematics Department had prepared for him. The next day, I went out early for a walk through Buenos Aires and my distracted steps took me to the old port of the La Boca neighborhood, where the imprint of the painter Quinquela Martín, a strong air of tango and the still latent vestiges of the life of immigrants Italians, make up the suburban essence of that place. On my return, I crossed Parque Lezama towards the heart of San Telmo and, to my surprise, in the historic Bar Británico, as it could not be otherwise, I made out the profile of Dr. J.O., at a table against a window. I stood on the sidewalk on Defensa Street while the professor turned his face toward me. My astonishment was even greater when Dr. J. O. made a gesture from inside the bar indicating for me to enter. I felt out of place in my gym clothes and worn-out sneakers, but I walked in and sat down in front of him anyway. Coffee in between, we talked for a few minutes about the city of Buenos Aires, which had surprised him so much. He told me that he found in its corners a curious Parisian and London configuration and the talk, in its beginnings, was about Argentine customs, European immigration and his interest in tango. Of course, I was a curious young man and very interested in his life, so I asked him what his student years were like and who his Variational Calculus teacher was.

There was an awkward silence, he took a sip of coffee and his gaze turned to the window where, on the other side, passersby were walking hurriedly in the winter cold towards their morning tasks. I will try to be as faithful as possible in my account of what he told me, for it is the best I can remember between his bad Spanish and my bad English.

"*It happened a long time ago, in England. We were a group of four funny young men interested in science and, even more so, in girls. We enrolled in the Variational Calculus course because we had heard some stories about Professor W. S., who taught the course, and not because Variational Calculus was of interest to us. He was, indeed, a young and mysterious man. He began his class by talking about the Moon, as he considered himself passionate about our natural satellite. At that time, there was talk of the possibility that in a very few years man would reach the Moon (something that happened almost a decade later) and that seemed to be a point of great interest for him. One of the first problems he posed to us was the following: 'Imagine that you have a spaceship that must travel from the Earth to the Moon and back. We want to find the trajectory (orbit) that minimizes the total fuel consumption during the entire trip.' He frequently resorted to Hamilton's Principle of Least Action, and spent time substantiating with intricate equations that geodesic orbits are those that follow the natural curvature of space-time around the Moon and are the solutions that minimize action. In all his classes he gave examples with the Moon and the attraction of bodies. He even went so far as to recite certain parts of Newton's Principia. We used to joke that he was such a Newtonian that, had he been a professor in 1905, Dr. W. S. would have defended the concept of the ether against Albert Einstein's nascent theory of relativity. As I told you, he was a mysterious man. Little was known about him and there was no room for us students to approach him. Rumors came and went, and someone said that Professor W. S. was working on an important and revolutionary deterministic theorem on orbital motion with far-reaching implications for physics and Variational Calculus; unsurprisingly, the Moon played a major role in his theory.*

We imagined multiple ways and strategies to obtain a key that would allow us to enter his gloomy office incognito and snoop through his papers and blackboards. We stood as if carelessly in front of his door to spy on the inside of his office just as he opened the door to enter or leave there, and we even went so far as to have the audacious mischief of peeping through the lock of the door to try to elucidate something of that mystery.

It was an intense but fun semester, with many adventures, student parties, nights with friends and young people happy for life. Some time later, when I was working on my doctoral thesis, an article caught my attention that reported on a discovery made by mathematician Edward Lorenz from the Boston Institute of Technology. Lorenz carried out computer simulations on the evolution of the climate of a certain region and discovered that small perturbations in the initial conditions of the system generated significant divergences over time. It was nothing more and nothing less than the birth of the famous phrase "A butterfly flap would be enough to trigger a cyclone" and, with it, the beginnings of Chaos Theory. As you know, over the years, mathematicians such as Mitchell Feigenbaum, David Ruelle and Floris Takens, or Benoît Mandelbrot himself (father of fractal geometry), were working on the theory.

Later, I worked for a few years as a researcher and lecturer in the United States, and when I returned to England in the early 1980s, I was surprised to find that things had not changed much. But one morning a colleague showed me a conference program in which a group of mathematicians would present the progress of their research. Topics ranged from topology to functional analysis and differential geometry. Suddenly, at the end of the list, as the last speaker, one name caught my attention: Dr. W. S., title to be confirmed.

That left me astonished and intrigued and a colleague was quick to declare that, according to rumors, he would present the physical-mathematical theory on which he had been secretly working for almost twenty-five years. Of course, I would be the first in line and I even managed to gather, with great joy, my four friends from college mischief, those with whom we attended Variational Calculus classes.

The day was long and very interesting. Mathematicians talked about new theories, conjecture proofs and challenging theorems, along with recent advances in computing. From time to time, we scanned our surroundings looking for the hunched figure of Professor W. S., because we were there because of him. Between talks and laughter we wandered the hallways that led to his office, feeling like those curious teenagers again, and we walked through the classrooms without any sign of him. The expectation was latent. Upon asking, we found out that very few students were coming to their classes, which were sometimes empty.

The penultimate speaker finished his presentation with applause and the moderator announced that Dr. W. S. would continue, but not before panning his gaze around the auditorium looking for the professor. There was a slow silence and then, the sound of the hinges of the chairs, whispered comments, some assistant who moved with a hurried step, exchanged glances. We were all expectant, but the teacher never showed up. There was no conference, no presentation of the long-awaited theorem and its lunar implications.

A few days later, we learned that the professor had submitted his resignation and had emptied his office at night. We didn't hear more about him. However, a rumor coming from the office of the director of the mathematics department said that Professor W. S.'s entire theory had collapsed due to certain implications of the Chaos Theory that he himself seemed to have deduced and that were closely related to the movement orbital of the Moon.

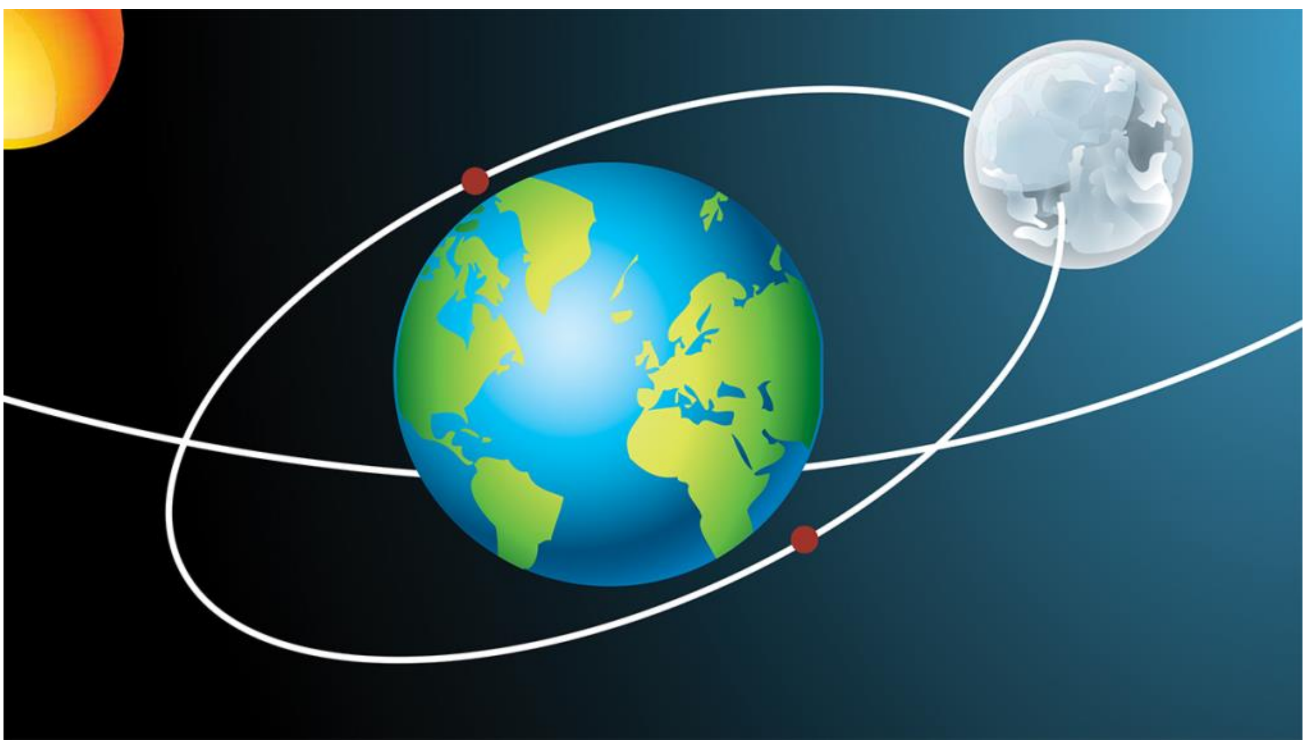
He died towards the end of the 1980s. In their house they found many articles and documents of recent publication that spoke of the research of G. J. Sussman, J. Wisdom and J. Laskar, who used powerful computers to perform a numerical simulation of the behavior of the outer and inner planets and discovered that, after a significant number of years, their orbits exhibited chaotic behavior. In particular, the orbital motion of the Earth, and with it the Moon, was unstable after ten million years.

We never knew about his research (if it really existed), but we understood that these new forms of mathematical thinking dealt a serious blow to Professor W. S.'s determinism."

I was enthralled and completely captivated by that story. After a brief moment in which he seemed to reflect, Dr. J. O. looked at his old watch and told me that he had to leave, since his flight to London was leaving in a couple of hours. I accompanied him to the door of the bar where he took a taxi. Before going up, he looked into one of his pockets and said, “Oh, a souvenir for you” and left. He had placed in my hand a small blue shield with three crowns and a book that reads a phrase in Latin.

Very late and to my regret, I learned that Dr. J.O. passed away a few years ago. According to his wife, in his last days he remembered his conferences in Buenos Aires and that emblematic Bar Británico (I sadly got excited thinking that, perhaps, he could have remembered me).

My vision is clouded in the corners of memories and, at times, I don't know how much imagination, fiction or reality there is in what I have just told you, dear reader. But regardless of the changes, the advances of science, our finitude and contingency and the fragile flutter of a butterfly, the Moon is still there, permanent on its throne as monarch of the heavens, showing its immutable face, beyond the chaos and order at the heart of disorder.



Lunar Topographic Studies
The Moon, Variational Calculus and Chaos Theory

Mare Humorum, Gassendi and Lacus Excellentiae 2023-11-25, 02:42 UT

Paul Walker

Here we are looking on the southwestern part of the Moon. The biggest feature here is Mare Humorum. Gassendi is the large crater at top. Lacus Excellentiae is the smooth area in the bottom center. It extends off the bottom of the image.

There are several wrinkle ridges in Humorum. It also has a prominent fault, Rupes Liebig (an escarpment), running along the western (left side). To help identify Rupes Liebig, there is a small 9 km crater (Liebig F) on the fault at the bottom end. Just to the lower right of Liebig F is the barely visible Rima Doppelmayer, paralleling the fault. This is hard to see visually being on the order of 1.5 km (1.0 mi) across with a large variation in width. It extends to the south end of Humorum, ending (or starting) next to its namesake crater, Doppelmayer. There is a relatively easy to see fault a little to the west of Humorum, called Rimae Mersenius, that runs up to the west of Gassendi. There are several grooves formed by faults identified with this name, including one at the north end of Rupes Liebig both of which I assume were created by the same or at least associated faults. Humorum has a nice sprinkling of small crater from 10 km on down below 1 km that make it good place to test your scope resolution and the seeing conditions.

Gassendi is a fractured floor crater with several small crisscrossing faults (Rimae Gassendi) and 3 distinct peaks in the center. The faults are a challenge to see, especially the smaller sections.

Mare Humorum, Gassendi and Lacus Excellentiae, *Paul Walker, Middlebury, Vermont, USA. 2023 November 25 02:42 UT, colongitude 57.5°. 10 inch f/5.6 Newtonian reflector telescope, 2x barlow, fl 3,946 mm. Canon T7i camera.*

Lunar Topographic Studies
Mare Humorum, Gassendi and Lacus Excellentiae

Focus-On: A Dream Landscape-Sinus Iridum

Alberto Anunziato

The maria on the Moon are a pareidolia of the Earth's oceans, as they are gigantic impact basins filled with lava effusions that resemble the shape of Earth's seas. This powerful pareidolia originated in the name of the lunar maria.

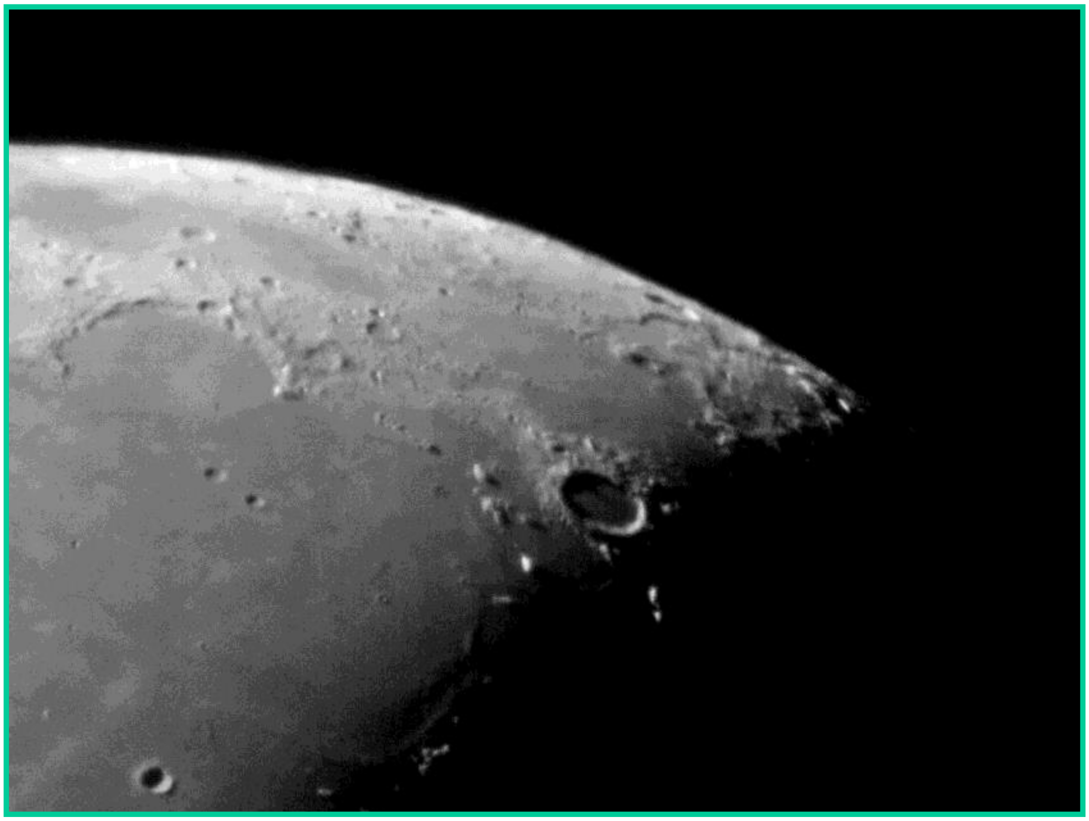


Image 1, Sinus Iridum, *Alberto Anunziato, Paraná, Argentina. 2020 January 18 06:32 UT. Meade EX105 Maksutov-Cassegrain telescope, QHY5-II-M camera.*

Image 2, Sinus Iridum, *Felix León, Santo Domingo, República Dominicana. 2021 November 04 00:05 UT. 90 mm Maksutov-Cassegrain telescope, L2-UV-IR cut filter, ZWO ASI462MC camera.*

Focus-On: A Dream Landscape-Sinus Iridum

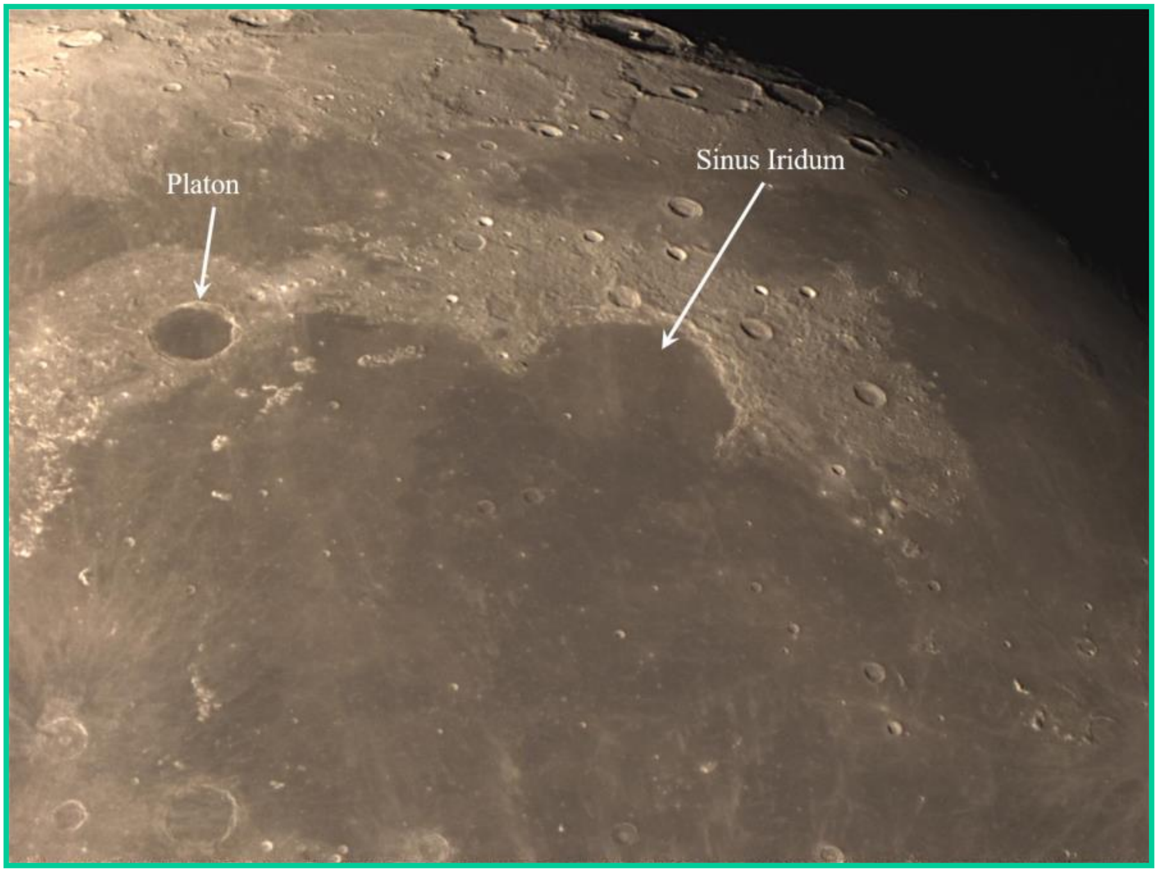


Image 3, Sinus Iridum, *Marcelo Mojica Gundlach, Cochabamba, Bolivia. 2022 July 12 00:15 UT. Meade 90 mm Maksutov-Cassegrain telescope, ZWO ASI178B/W camera. West is right, east is left.*

Image 4, Pythagoras, *David Teske, Louisville, Mississippi, USA. 2020 October 01 03:47 UT, colongitude 77.0°. 4 inch f/15 refractor, IR block filter, ZWO ASI120mm/s camera. Seeing 7/10.*

Focus-On: A Dream Landscape-Sinus Iridum

Image 5, Sinus Iridum, *David Teske, Louisville, Mississippi, USA. 2023 May 02 03:06 UT, colongitude 48.9º. 60 mm f/15 refractor, IR block filter, ZWO ASI120mm/s camera. Seeing 8-9/10.*

Sinus Iridum, the "rainbow bay" is a pareidolia of a bay that reinforces the oceanic pareidolia: "Sinus Iridum, a well-defined bay in Mare Imbrium measuring 260 km in diameter. Sinus Iridum is an impact basin that has been flooded with lava, completely submerging half its wall" (Grego). The most complete description can be found in Garfinkle: "The C-shaped Sinus Iridum ("Bay of Rainbows") is the remains of a large Imbrium-age crater that impacted near the western edge of the "Imbrium Basin" before the basin filled to its present level with lava. Apparently, the materials that would have formed Iridum's eastern crater walls landed in the basin and have been completely buried by subsequent lava flows. Montes Jura forms Iridum crater's lofty western rim. Sinus Iridum is about 249.29 km (145.90 miles) in diameter across its mouth, and is about 160 km (100 miles) deep from the mouth to the base of Montes Jura below the Eratosthenian-age satellite crater Bianchini D (lat 47.55°N, long 35.70°W). The sinus covers an area of about 238,279 sq. km (92,000 square miles)".

Before making a description of the most conspicuous of our area, we should perhaps start with the most notoriously obvious, due to its lack: "The southern rim of Sinus Iridum is missing. Where did it go? The most likely explanation is that the projectile on the slopping floor of the Imbrium basin and the southern rim is buried under mare lava. But this doesn't quite explain all the observations. Look at Sinus Iridum when the Sun is low and you'll see that though the western segment of the rim does appear to become lower to the Cape Heraclides, the northeastern rim maintains its height until it reaches Cape Laplace, a large massif that cast impressive shadows. Perhaps the rim of Iridum was dropped by a giant fault. Is there a large Apennine scarp-like feature buried under Imbrium that truncates the rim of Sinus Iridum? There is little evidence one way or the another" (Wood). We can imagine the other half of the Iridum crater, we can reasonably deduce where it would be, but it remains unknown.

We begin the description of Sinus Iridum at its western end. Promontorium Heraclides, together with its eastern companion Promontorium Laplace, reinforce the marine pareidolia, resembling two capes located at the two ends of the bay. The description belongs to Garfinkle: "The rugged triangular-shaped Imbrium-age Promontorium Heraclides stands at the southern opening of Sinus Iridum. The promontorium is the southeastern tip of Montes Jura and rises steeply from the sinus surface lavas. The promontorium is divided into two mountain ridges separated by an east to west valley of smooth Imbrium-age materials. The highest point on it is on the northern mountains and it reaches an elevation of about 1430 m (4692 feet) above the sinus surface. To the northeast of the promontorium is a smattering of small cone craters and their high-albedo ejecta blankets. Another field of cone craters is located to the southeast of the promontorium. This feature has been adorned with the fanciful unofficial name of the "Moon Maiden," because on the lunar map drawn by Gian Domenico Cassini in 1679, in which he made the mountains appear to be the head and shoulders of a graceful, beautiful female with long, flowing tresses". I have never seen the Moon Maiden with my telescope, have you? In this case, the new pareidolia comes from Cassini's drawing skills (could it have been some hidden joke?).

If we see IMAGE 6 and focus on Promontorium Heraclides (the far left of the bay), we confirm that there are two mountain ridges, especially indirectly due to the shape of their shadow. This image also captured a very rare moment of the illumination in Sinus Iridum, what is known as “The Lunar Buzz Saw”, a sunset effect, due to the semicircular shape of the Jura Mountains illuminated from the east, whose shadow appears to have the shape of a circular saw blade (another pareidolia!).

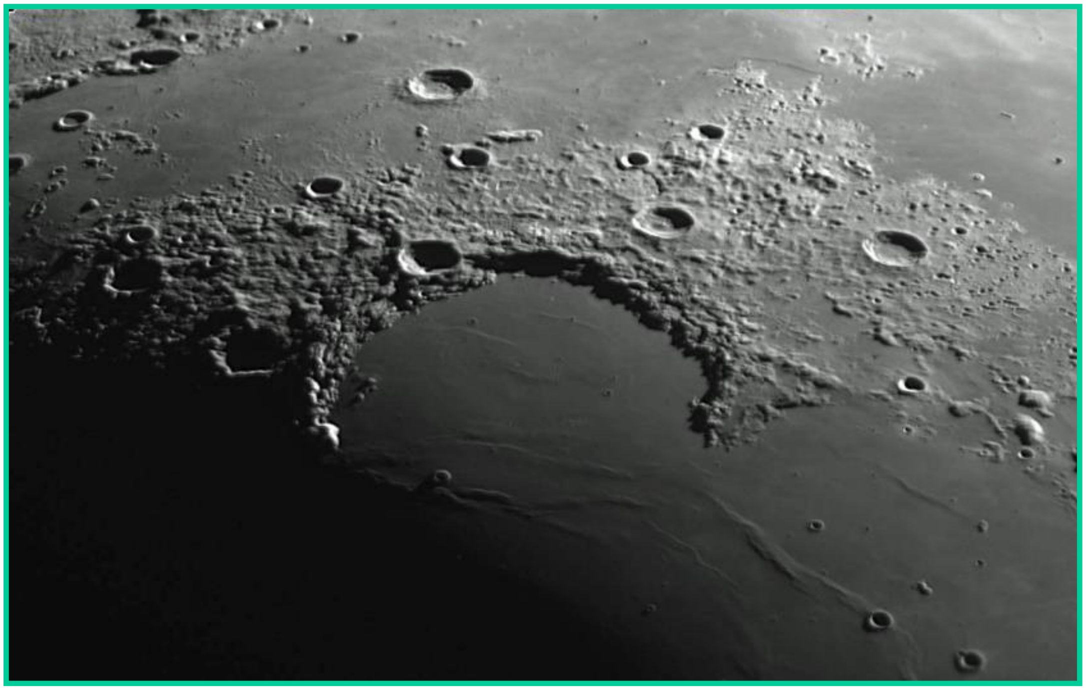


Image 6, Sinus Iridum, *Larry Todd, Dunedin, New Zealand. 2023 May 15 18:41 UT. OMC 200 mm Maksutov Cassegrain telescope.*

The edge of Iridum that forms the rainbow bay is the Jura Mountains: “The remains of these rugged arcuate mountains form an arc of highlands, valleys, ravines, and steep canyons around the western side of Sinus Iridum, from Promontorium Laplace in the northeast to Promontorium Heraclides in the southwest. The mountain range is about 420.8 km (261.47 miles) in length. In some places, the mountains rise steeply from the sinus surface and in others the slopes are gentle. The mountains tend to be very steep along the shore of the sinus, with peaks that rise to about 4000 m (13,120 feet) above the sinus surface, then taper off in gently rolling hills northwestward toward Mare Frigoris, Sinus Roris, and Oceanus Procellarum. A distinct demarcation is noticeable between where the montes are concentric, with the sinus and where they intersect with the sculptured hills that tend to run radial to Mare Imbrium and head downslope toward the northern maria bordering this area. The highest summits are in the area between the craters Bianchini and Sharp. The albedo of the mountains ranges from high on the steep slopes to low on the benches and valley floors. The intricate nature of these mountains will entice you to study them whenever they are illuminated” (Garfinkle).

We have a series of images in which we will enjoy the Jura Mountains, ordering them from the images in which they appear brightest to those in which they cast their deepest shadows. In IMAGE 7 to 9 the Jura Mountains are the highest points that begin to be illuminated by the first rays of the rising sun on Sinus Iridum, this effect of lights and shadows caused by these curved mountains (actually the very high walls of the crater Iridum) has been called the “Jeweled Handle" or the “Golden Handle”. The Jura Mountains are still very bright in IMAGES 10 to 12 (you can see the text by Rik Hill with the description of this image. More frontal lighting shows more detail of the very steep slopes of the Iridum crater rim (which must have been magnificent when it was recent), as we see in IMAGES 13 to 18. In IMAGE 19 we can see in great detail the Bianchini crater (38 km in diameter), which breaks the symmetry of our bay: “Notice the crater - "Bianchini - that cuts into the rim of Sinus Iridum. Do you see that the impact of Bianchini caused a landslide of material that extended the Iridum wall out onto the lava floor?" (Wood, 2006). See IMAGES 20 to 22.

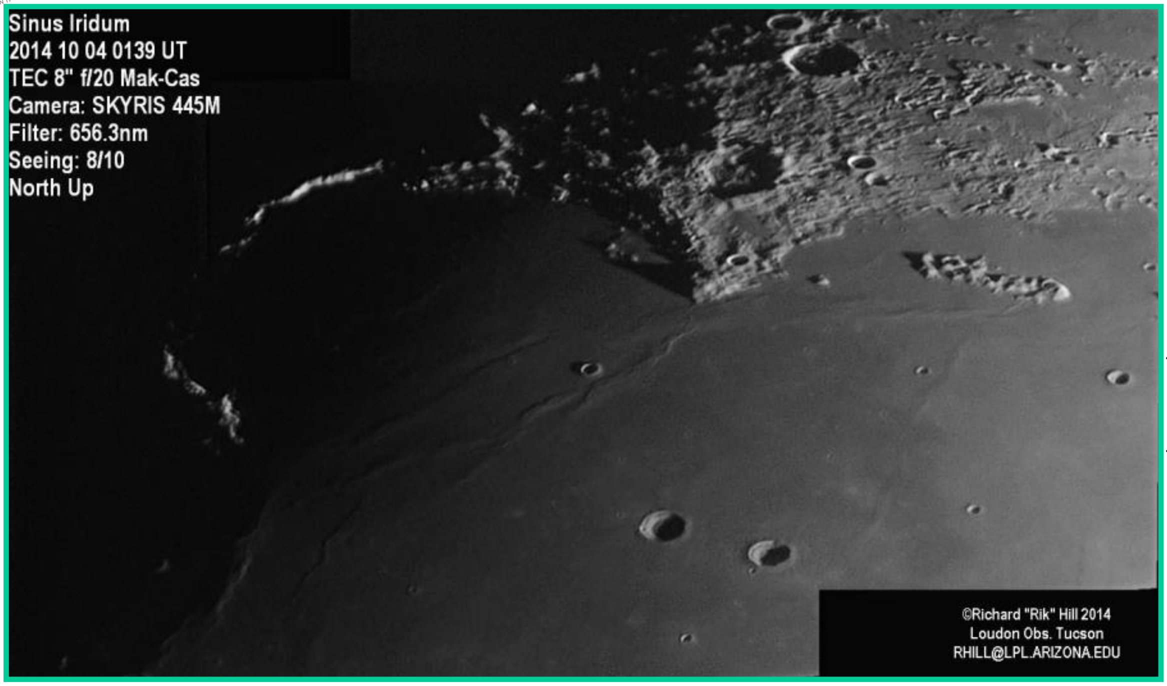


Image 7, Sinus Iridum, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2014 October 04 01:39 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 656.3 nm filter, SKYRIS 445M camera. Seeing 8/10*

Image 8, Sinus Iridum, *Roberto Podestá, Formosa, Argentina. 2019 October 19 00:14 UT. 127 mm Maksutov-Cassegrain telescope, CCD camera.*

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Focus-On: A Dream Landscape-Sinus Iridum

Image 9, Sinus Iridium, *Felix León, Santo Domingo, República Dominicana. 2021 January 23 23:10 UT. 127 mm Maksutov-Cassegrain telescope, DMK21618AU camera. North is right, west is down.*

Image 10, Sinus Iridum, *Jean Bourgeois, Pic du Midi observatory, altitude 2877m, Pyrénées, France. 1986 January 21. 1 meter reflector telescope, f/10, Kodak TP2415 film, no post processing.*

Focus-On: A Dream Landscape-Sinus Iridum

Image 11, Sinus Iridum, *Jean Bourgeois, Pic du Midi observatory, altitude 2877m, Pyrénées, France. 1986 January 21. 1 meter reflector telescope, f/10, Kodak TP2415 film, no post processing.*

These images were submitted by Michel Deconinck. Michel adds " Born in 1938 in Belgium, Jean Bourgeois is a great adventurer(s) and mountaineer(s) of his time. He has climbed the highest mountains from the Himalayas to Antarctica. Curious about men, with his wife he brought back fabulous testimonies from the last trader nomads of Afghanistan. In 1982 his dramatic disappearance on the slopes of Everest and his miraculous reappearance after several weeks on the Tibetan side(,) went around the world.

Jean Bourgeois is also an astronomer who was invited in 1985 to participate at Pic-du-Midi Observatory, for a photometric campaign on the triple quasar Q115 +080, in Leo. The goal was to estimate its distance by measuring delays between component's light variations. He was then invited for other projects and discovered that the one-meter telescope was not used around the full Moon. The Director agreed to let him observe lunar occultations during these periods. It was a successful experience during four years with this remarkably good telescope situated in an exceptionally favorable site at an altitude of 2870 meters in the French Pyrenees."

Focus-On: A Dream Landscape-Sinus Iridum

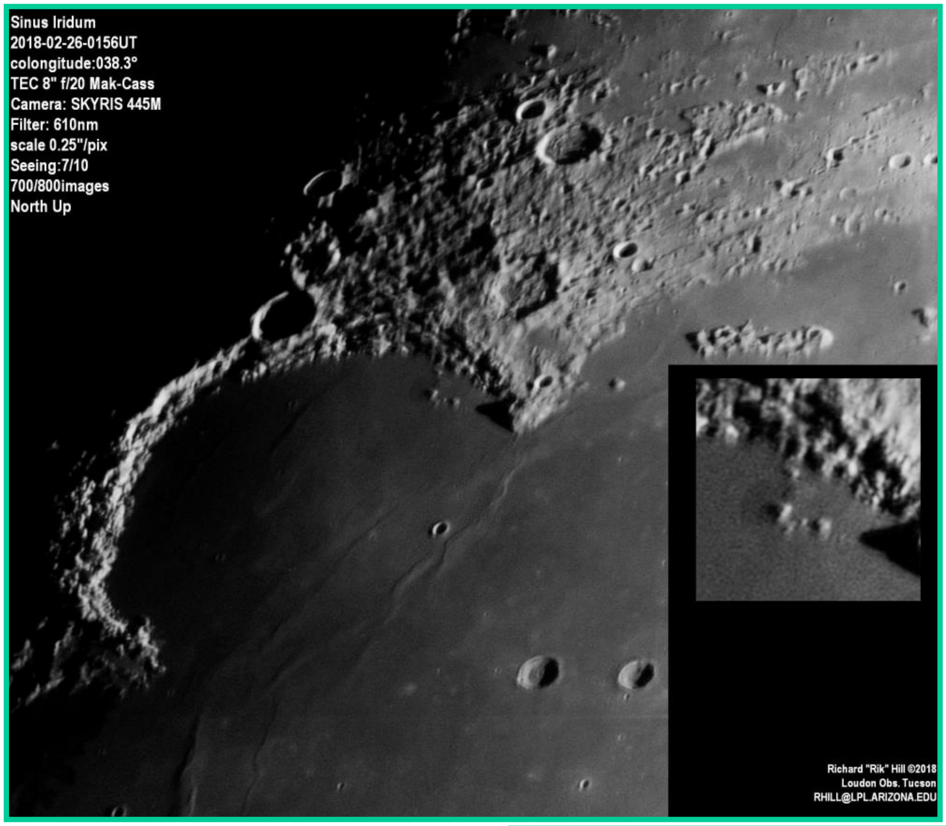


Image 12, Sinus Iridum, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2018 February 26 01:56 UT, colongitude 38.3º. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm filter, SKYRIS 445M camera. Seeing 7/10.*

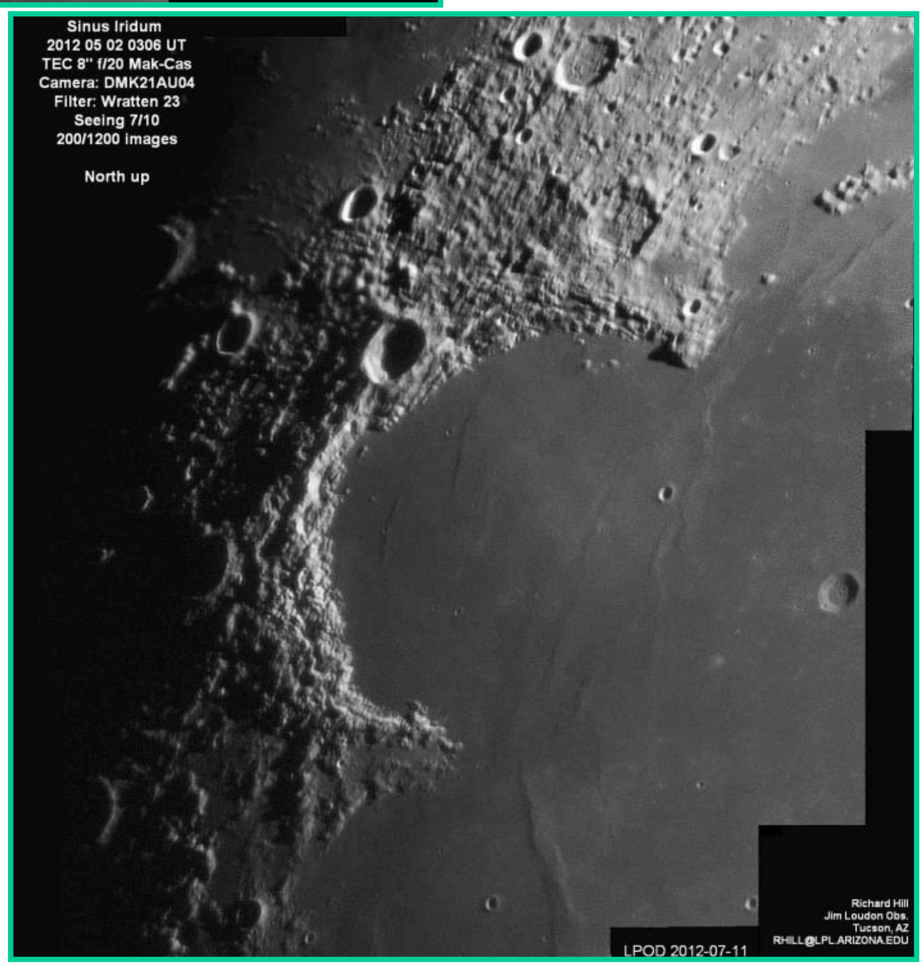


Image 13, Sinus Iridum, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2012 May 02 03:06 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, Wratten 23 filter, DMK21AU04 camera. Seeing 7/10.*

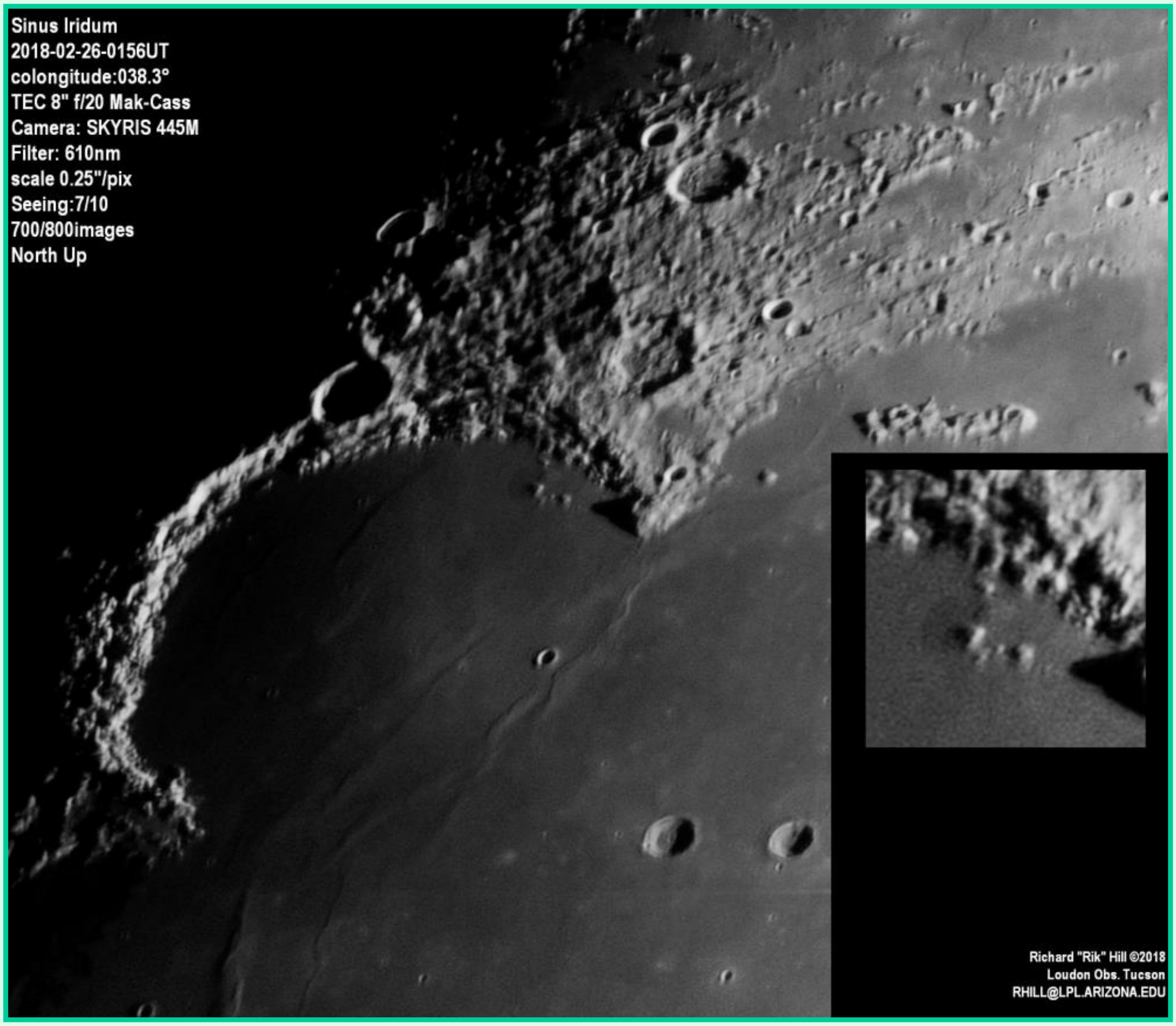
Focus-On: A Dream Landscape-Sinus Iridum

Sinus Iridum

Rik Hill

The Bay of Rainbows, or Sinus Iridum, is a glorious sight as the Montes Jura catch the first of the morning light. At the south end of these mountains is Promontorium Heraclides and the north point is Promontorium Laplace casting a nice triangular shadow to the west. The shadow filled crater near the middle of the Montes Jura is Bianchini (39 km dia.). Near the mouth of the Bay are two similar sized craters acting as sentinels, Helicon (26 km) on the left and Le Verrier (20 km) on the right. Above the inset is a curious set of mountains, the Montes Recti, the very tips of a once magnificent range buried in the Mare Imbrium lava.

The shadow of Prom. La Place points to a couple small peaks that are next to a couple charted domes. You can see them on the magnified inset of that region where the one dome is north of the left peak and the other dome is more of a darker apron to the left of that peak. Amazing what you can see when you look a little closer.



Sinus Iridum, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2018 February 26 01:56 UT, colongitude 38.3°. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm filter, SKYRIS 445M camera. Seeing 7/10.*

(This was originally in The Lunar Observer April 2018)

Focus-On: A Dream Landscape-Sinus Iridum

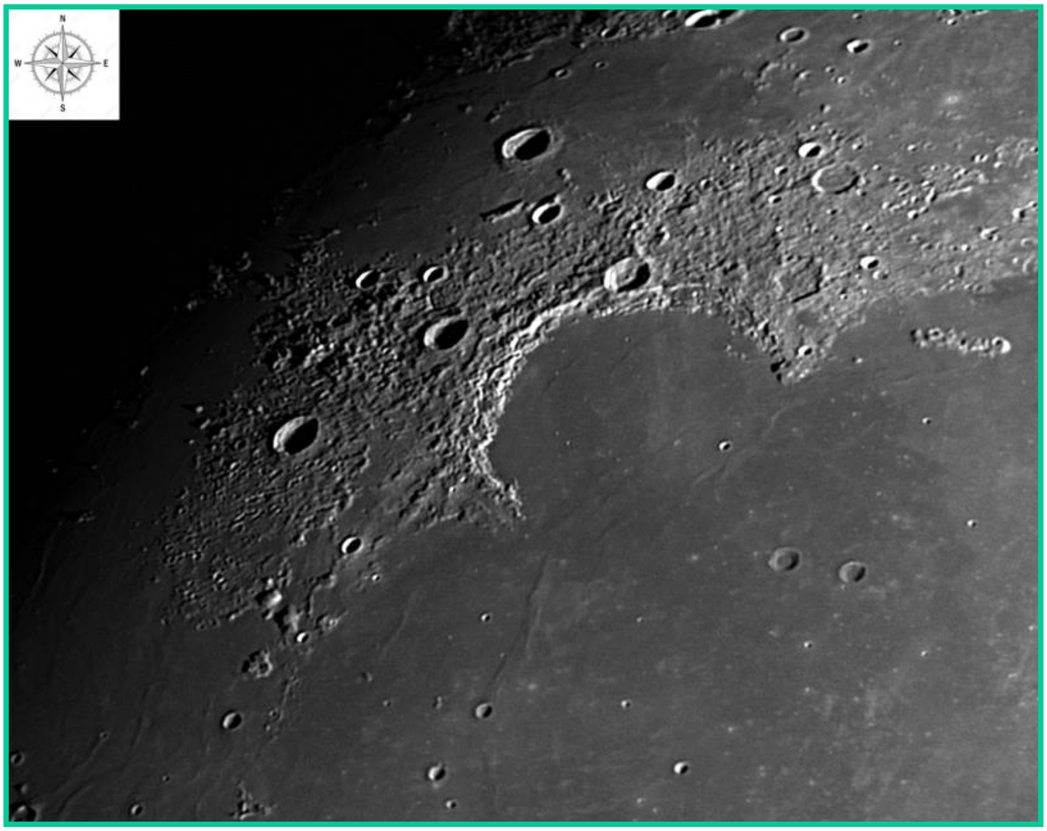


Image 14, Sinus Iridum, *Marcelo Mojica Gundlach, Cochabamba, Bolivia. 2023 August 27 23:35 UT. Meade 90 mm Maksutov-Cassegrain telescope, IR/UV cut filter, ZWO ASI178B/W camera. Seeing 5/10, transparency 3/6.*

Image 15, Sinus Iridum to Plato, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2020 April 04 04:20 UT. Dynamax 6 inch Schmidt-Cassegrain telescope, 2x barlow, 665 nm filter, SKYRIS 445M camera. Seeing 7-8/10.*

Focus-On: A Dream Landscape-Sinus Iridum

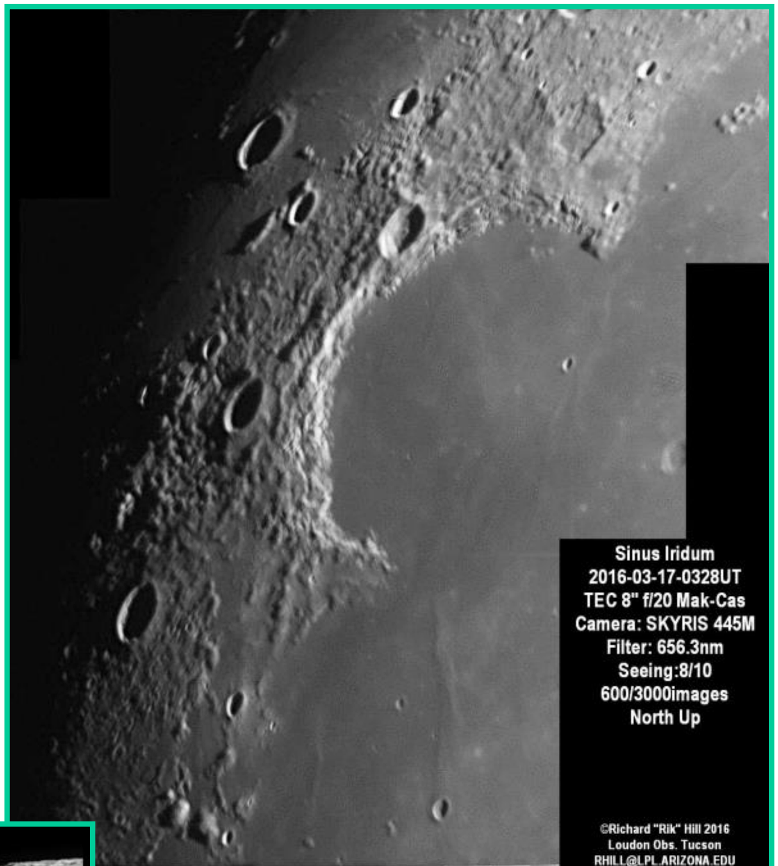


Image 16, Sinus Iridum, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2016 March 17 03:28 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 656.3 nm 23 filter, SKYRIS 445M camera. Seeing 8/10.*

Image 17, Plato, *David Teske, Louisville, Mississippi, USA. 2022 February 12 02:10 UT, colongitude 36.0°. 4 inch f/15 refractor, IR block filter, ZWO ASI120mm/s camera. Seeing 8/10.*

Focus-On: A Dream Landscape-Sinus Iridum

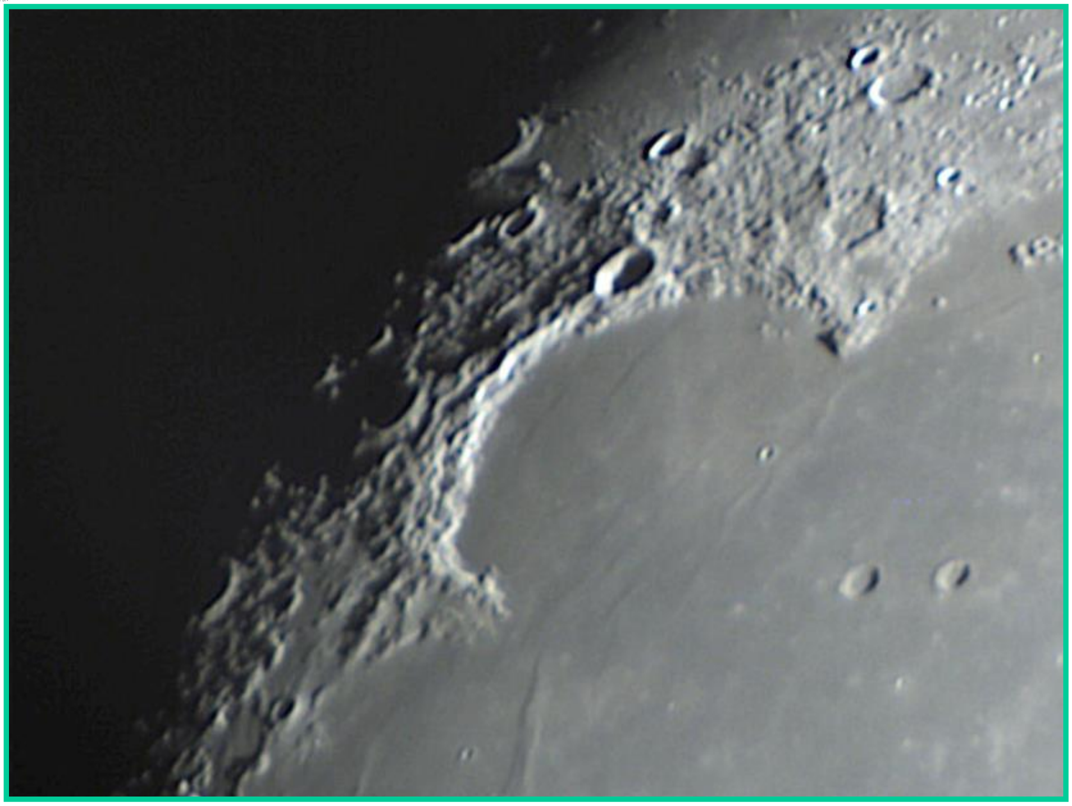


Image 18, Sinus Iridum, *Walter Ricardo Elias, Oro Verde, Argentina, AEA. 2023 November 23 23:35 UT. Sky Watcher 150 mm reflector telescope, 3x barlow, QHY5-II-C camera.*

Image 19, Sinus Iridum, *Ken Vaughn, Cattle Point, British Columbia, Canada. 2023 October 26 04:38 UT. 12 inch Meade LX200 GPS Schmidt-Cassegrain telescope, Astronomik 642 R-IR filter, ZWO ASI178 MM camera. Seeing 4/10, transparency 5/6.*

Focus-On: A Dream Landscape-Sinus Iridum

Image 20, Plato, *David Teske, Louisville, Mississippi, USA. 2022 February 12 02:10 UT, colongitude 36.0°. 4 inch f/15 refractor, IR block filter, ZWO ASI120mm/s camera. Seeing 8/10.*

Image 21, Sinus Iridum, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2019 February 17 03:20 UT. 200 mm refractor telescope, QHY5-II camera.*

Focus-On: A Dream Landscape-Sinus Iridum

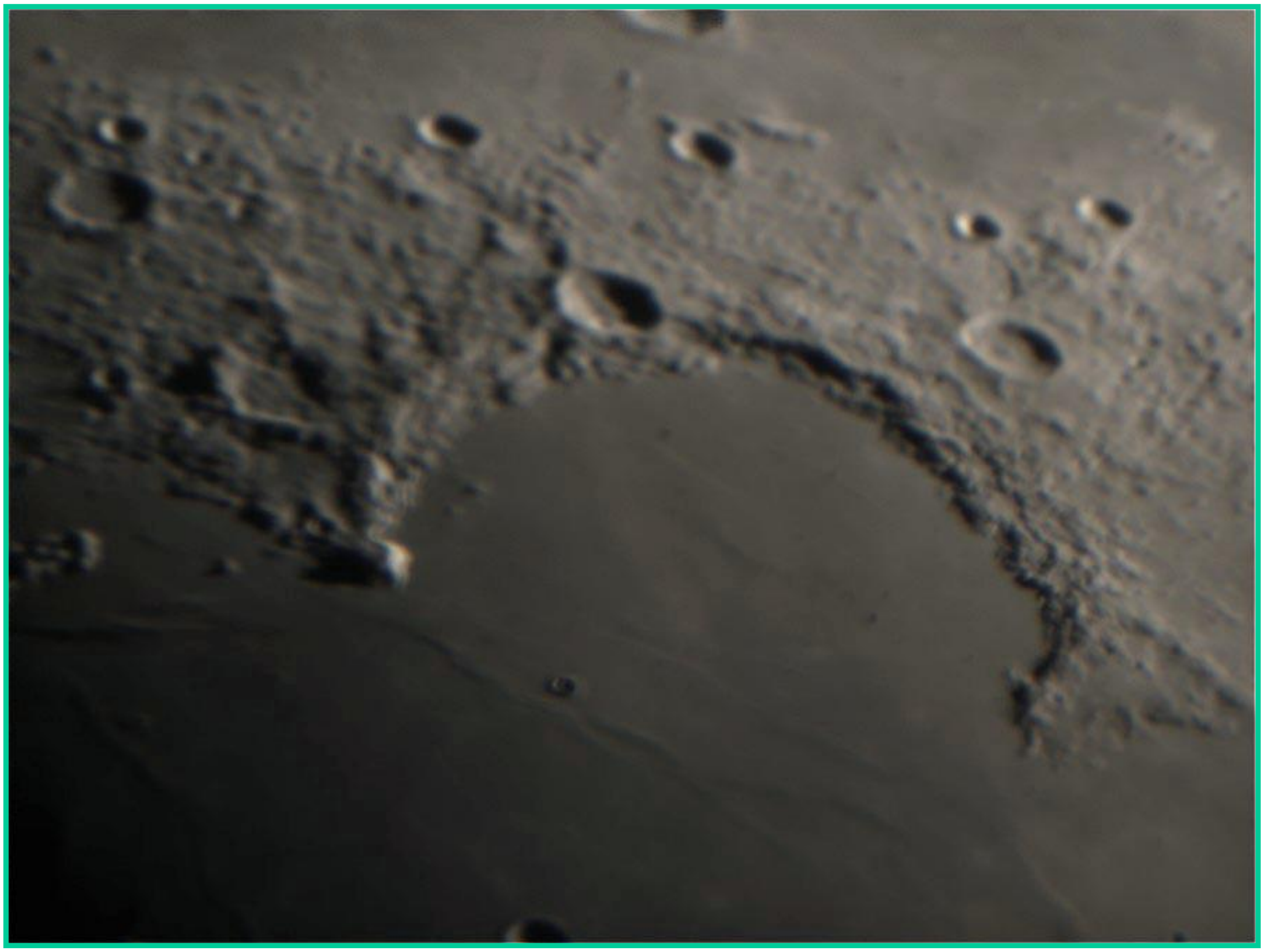


Image 22, Sinus Iridum, *Larry Todd, Dunedin, New Zealand. 2021 May 06 17:26 UT. OMC 200 mm Maksutov Cassegrain telescope.*

The interior of Sinus Iridum, like the interior of its geologically contemporary Plato, is a challenge for our visual acuity and the resolution of our telescope: “Also look at all the small craters pockmarking the Iridum bay - usually you only see the 4-5 largest ones but with our close approaching tourship we see dozens more!” (Garfinkle).

Image 23, Sinus Iridum, *Larry Todd, Dunedin, New Zealand. 2021 June 21 07:42 UT. OMC 200 mm Maksutov Cassegrain telescope.*

Image 24, Sinus Iridum, *Larry Todd, Dunedin, New Zealand. 2020 July 02 09:19 UT. OMC 200 mm Maksutov Cassegrain telescope.*

Clearly the interior of Sinus Iridum is an area with a low density of craters, the largest crater is Laplace A, and it is only 9 km diameter. In IMAGES 25/26 we see more small craters and also an interesting chain of craters, which we will include in a future Focus On Section that we will dedicate to these groupings of craters: "Look at the faint line of brightening that runs diagonally across the bay toward Bianchini - see the small pits along it? This is a ray but what was its source? Could it be Copernicus, more than 1000 km to the south?" (Wood, 2006). The probable confirmation that the bright ray that Wood mentions comes from Copernicus is IMAGE 27, in which the system of bright rays of Copernicus can be seen and if we make an extension, it seems that the bright ray of Sinus Iridum is actually radial to Copernicus. What makes it so interesting is the combination of bright ejecta material with a chain of secondary craters.

Image 25, Sinus Iridum, *Massimo Bianchi, Milan, Italy. 2022 April 13 19:00 UT. Vixen VMC 260L Maksutov Cassegrain, Baader G filter, ZWO ASI178MM camera. Seeing 4/10*

Focus-On: A Dream Landscape-Sinus Iridum

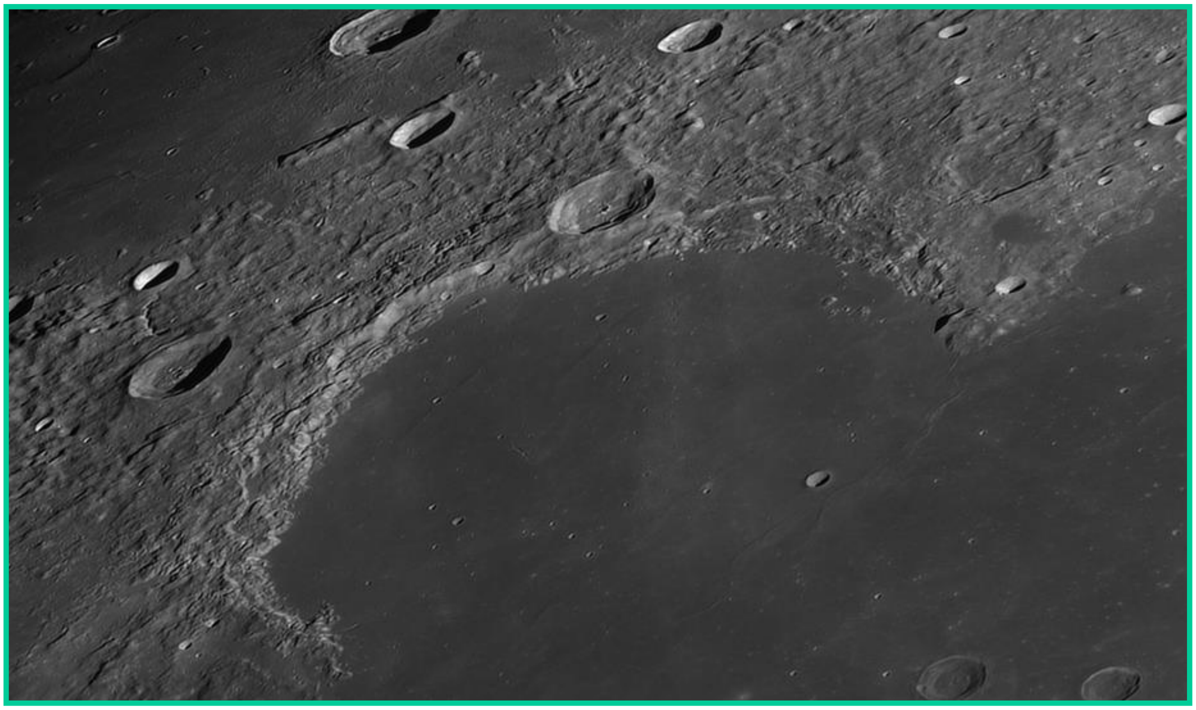
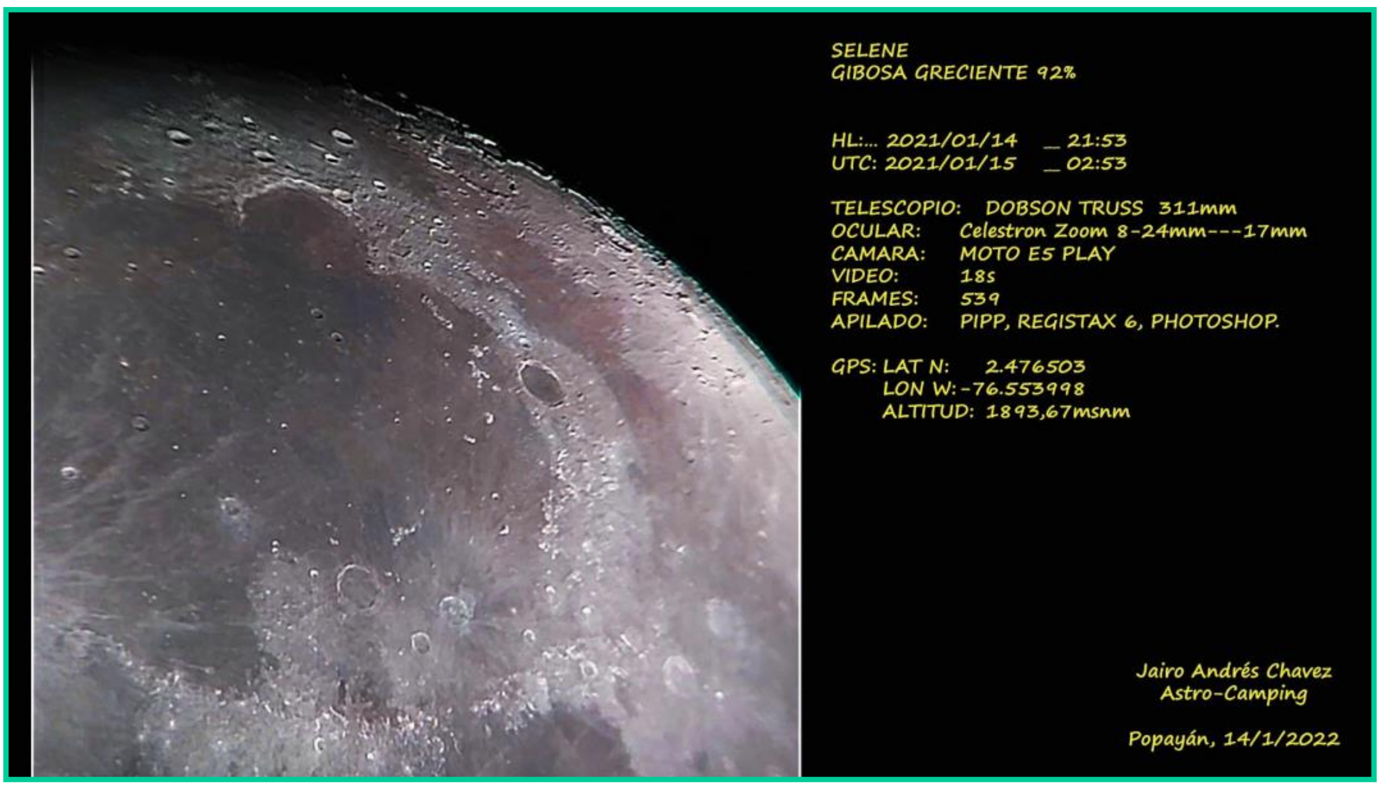


Image 26, Sinus Iridum, *Massimo Bianchi, Milan, Italy. 2023 March 4 19:16 UT. Vixen VMC 260L Maksutov Cassegrain, Baader G filter, ZWO ASI178MM camera. Seeing 4/10.*

Image 27, Sinus Iridum, *Jairo Chavez, Popayán, Colombia. 2022 January 15 02:53 UT. 311 mm truss tube Dobsonian reflector telescope, MOTO E5 PLAY camera.*



Focus-On: A Dream Landscape-Sinus Iridum

If we look at the previous images, and IMAGE 28, especially, we appreciate another maritime pareidolia: to the illusion of a bay, we add the illusion of waves inside it, in the beautiful words of Robert Garfinkle: "An unnamed wrinkle ridge extends across the mouth from Promontorium Laplace southward toward the vicinity of Promontorium Heraclides. Additional unnamed wrinkle ridges run diagonally northeast to southwest across Sinus Iridum. Their parallel appearance gives the effect of ocean waves that were frozen in place as they were heading into the sinus". For Peter Grego, the wrinkle ridges we see in the previous images would be "Traces of buried structure can be seen in a number of low wrinkle ridges on the border of Sinus Iridum and Mare Imbrium; they connect Promontorium Laplace with the east-pointing headland of Promontorium Heraclides, on the opposite side of the bay". We see in IMAGE 29, taken in a unique moment of illumination and with a wide field that allows us to understand Grego's suggestion: the wrinkle ridges that go from Promontorium Heraclides to Promontorium Laplace could be superficial manifestations of the underground relief, probably one of the exterior rings of the Imbrium basin, the stratigraphic order is given by Wood (2003): "Sinus Iridum, like Plato and Archimedes, is a crater that formed after the Imbrium basin but before the subsequent mare flooding."

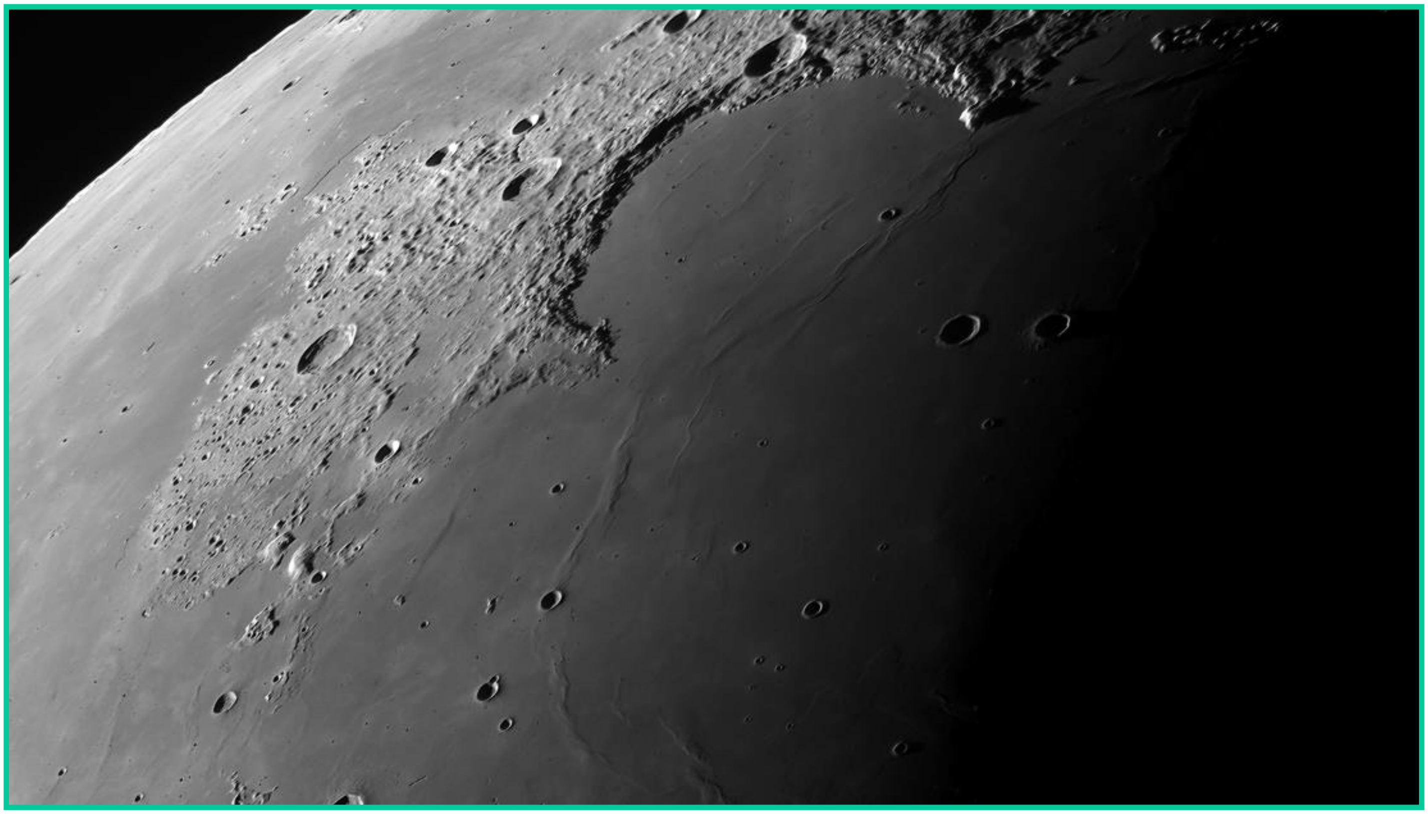


Image 28, Sinus Iridum, *Fredrick toe Laer, J. Bresser Observatory in Borken, Germany. 2023 September 09 03:04 UT. 16 inch Schmidt-Cassegrain telescope, ZWO ASI290mm camera. Fredrick adds* "This is a panorama made of 6 panels showing Sinus Iridum, Dorsum Heim and Mare Imbrium. The sun is setting over Le Verrier and Montes Recti (on top right). Other notable Features include Rima Sharp (top left section) and Mons Gruithuisen and Mons Gruithuisen Delta (bottom left section). The latter being and interesting subject to read up on.

Image 29, Mare Imbrium, *David Teske, Louisville, Mississippi, USA. 2022 May 11 01:46 UT, colongitude 28.4º. 4 inch f/15 refractor, IR block filter, ZWO ASI120mm/s camera. Seeing 8/10.*

If we see a detailed image like IMAGE 30, we do not see another selenographic feature related to the locations of the lava, the rilles. The observed ridges differ quite considerably between the interconnected segments that form a unit running south of Laplace A (which we referred to above as a probable surface manifestation of an Imbrium basin ring) and the segments running east-west within of the bay (orientation that makes them difficult to observe). If we see IMAGE 31, we understand the complete panorama of the wrinkle ridges in the area: the dorsa in the interior of the bay have a simple structure, in which the upper element (the crest) is barely perceived above the arch, passing over one of its margins and without changes in direction or secondary ridges. While IMAGE 32 shows in impressive detail the much more complex wrinkle ridge that runs between Laplace A and Sinus Iridum: the arch segments present gradations in height with secondary segments and the crest migrates from one margin of the arch to the other in various parts of the arch, as well as secondary crests. We analyze the topography of this ridge in another text, complementary to this one, in this same edition of The Lunar Observer. A magnificent sketch by Robert H. Hays Jr. is also included with a description of this wrinkle ridge in this issue.

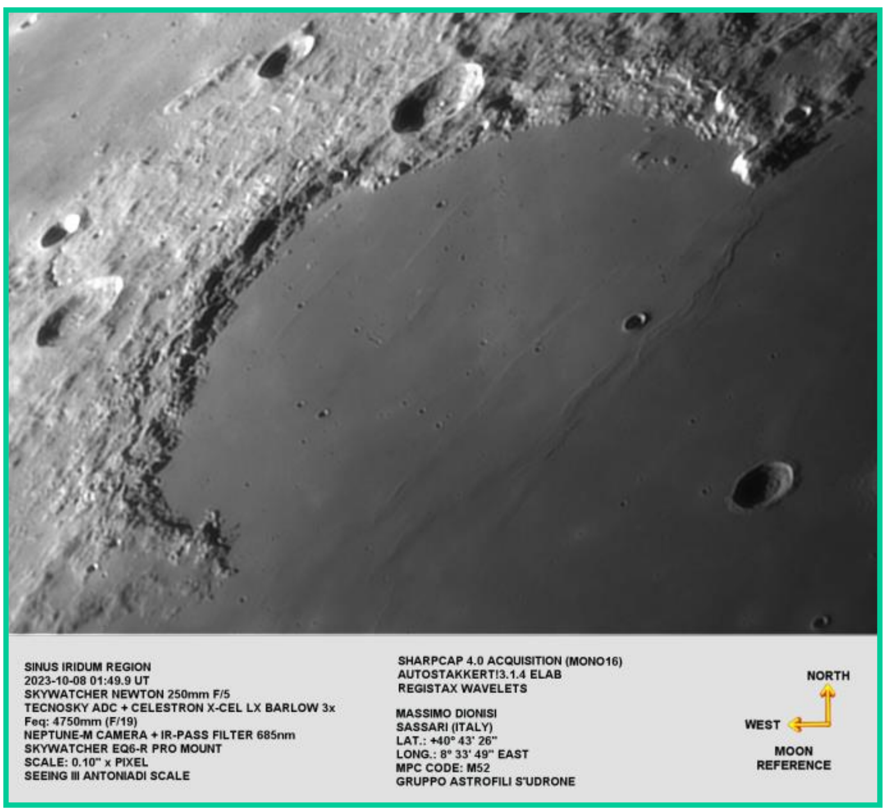


Image 30, Sinus Iridum, *Massimo Dionisi, Sassari, Italy. 2023 October 08 01:49 UT. Skywatcher 10 inch f/5 Newtonian reflector telescope, Tecnosky ADC, Celestron X-cel LX Barlow 3x, fl 4,750 mm, IR Pass filter 685 nm, Neptune-M camera. Seeing III Antoniadi Scale.*

Focus-On: A Dream Landscape-Sinus Iridum

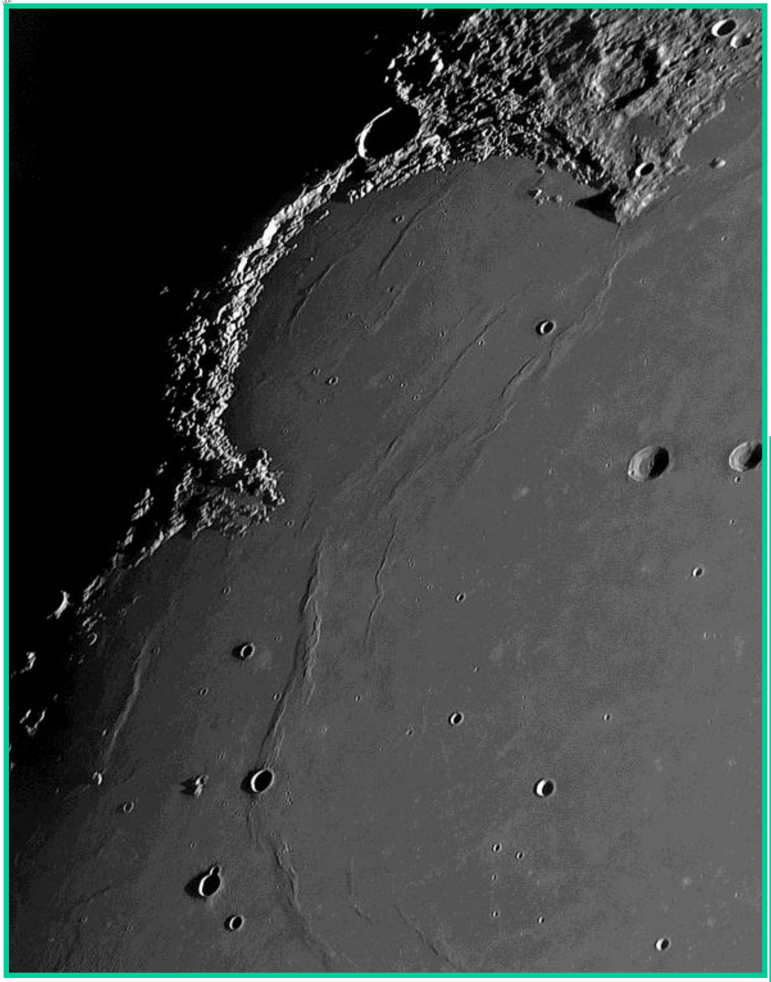


Image 31, Sinus Iridum, *KC Pau, Hong Kong, China. 2023 November 23 11:29-11:30 UT. 10 inch f/6 Newtonian reflector telescope, 2.5x barlow, QHYCCD290M camera.*

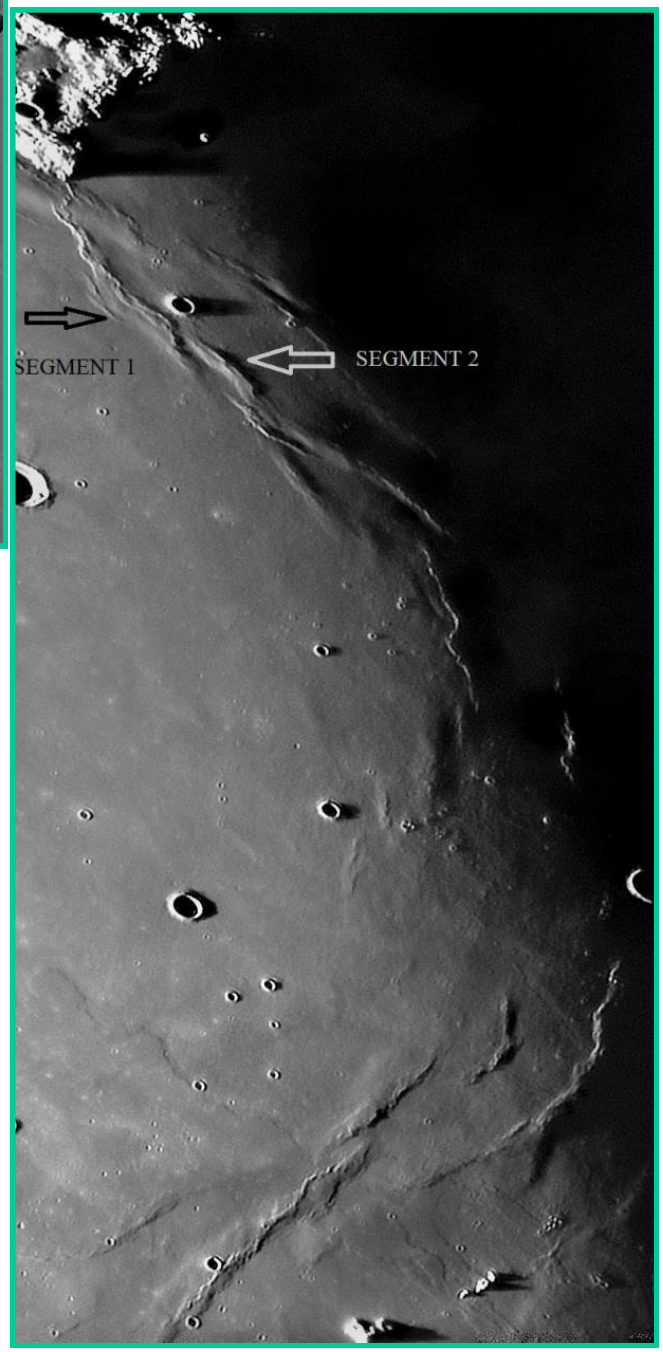
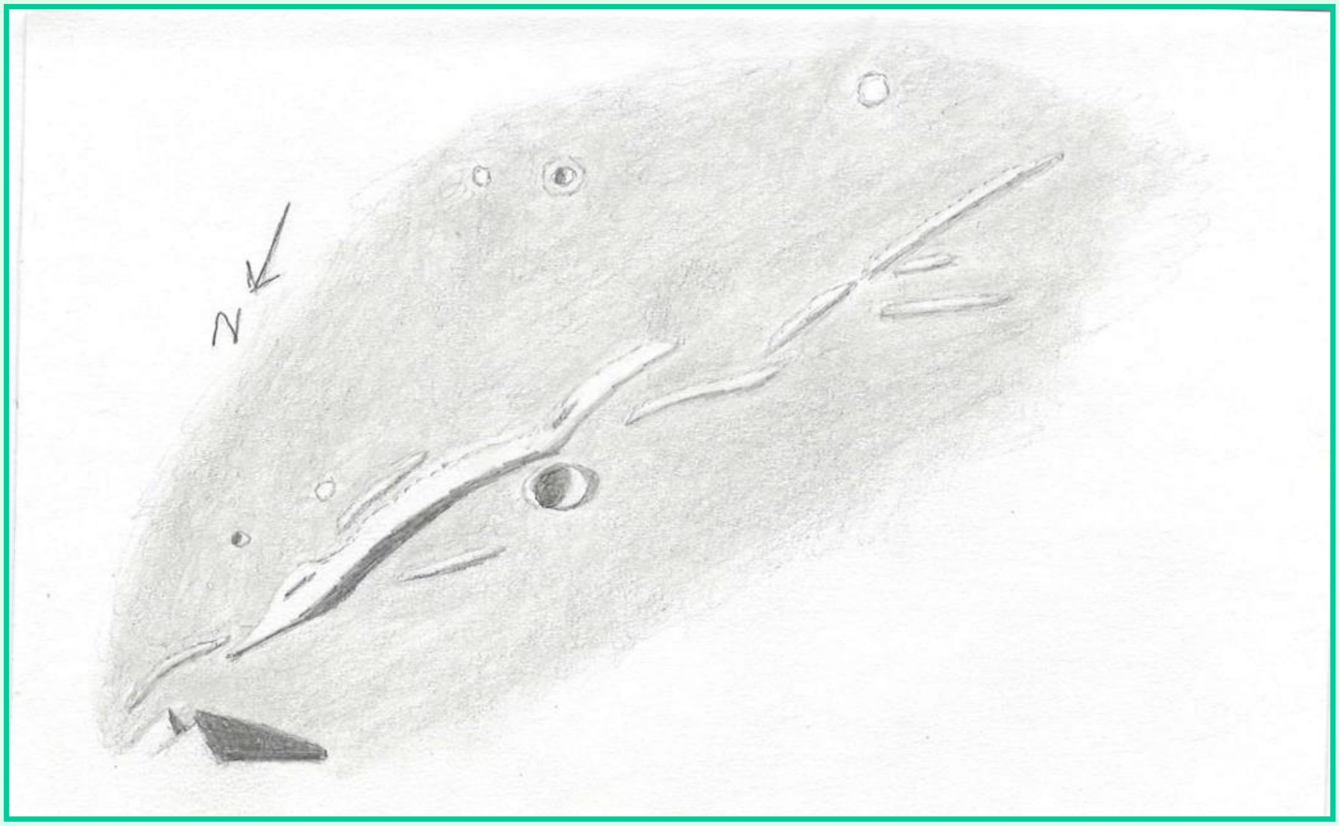


Image 32, Wrinkle Ridge South of Laplace A, *KC Pau, Hong Kong, China. 2022 April 11 12:11. 10 inch f/6 Newtonian reflector telescope, 2.5x barlow, QHYCCD290M camera.*

Focus-On: A Dream Landscape-Sinus Iridum

Wrinkles Near Laplace A

Robert H. Hays, Jr.



Wrinkles near Laplace A, *Robert H. Hays, Jr., Worth, Illinois, USA. 2013 January 22 02:46-03:04; 03:12-03:26 UT. 15 cm reflector telescope, 170 x. Seeing 8-6/10, transparency 6/6.*

I drew this area on the evening of January 21/22, 2013. Laplace A is at the entrance of Sinus Iridum, southwest of Promontorium Laplace. This is the prominent double peak at the eastern end of Sinus Iridum. The area was fairly near the terminator, and Laplace A had substantial interior and exterior shadow. A collection of wrinkles is nearby, some of which are shown here. The longest wrinkle extends from southwest of Laplace A, then just south of that crater, then to a sharp point south of Promontorium Laplace. This wrinkle has slight bends and curves, and relatively dark shadowing, especially near the point. A tiny pit, not on the Lunar Quadrant map, is near the pointed tip, and a bright spot nearby. Very low wrinkles are near this spot and northeast of Laplace A, and a short, vague, tapering wrinkle is east of the aforementioned point and south of Promontorium Laplace. Additional wrinkles were noted and drawn southwest of Laplace A. One is just southwest of that crater. Two straight wrinkles would have been one except for the gap between them. Two short wrinkles are west of this pair. I realized later that I may have seen two overlapping sets of parallel wrinkles angled at 30^{o} apart. The prominent wrinkle is approximately parallel with the would-be long, straight one. The wrinkles just northeast and southwest of Laplace A appear to be parallel with the pair west of the long, broken wrinkle. The terrain south of Laplace A appears to be very smooth with only a few features. The pit Helicon G is in this area and is surrounded by a halo. A tiny, bright spot is just to its east. Helicon C is the larger bright spot farther to the southwest. I could not detect any shadowing in or next to it, and the Lunar Quadrant map simply indicates it as a 'spot.' There are more wrinkles farther northwest which I started to draw, but the seeing was worsening. It was also cold (6^{o}F, -14^{o}C). What I drew was basically an introduction to that area.

Focus-On: A Dream Landscape-Sinus Iridum

Also related to the lava, along with the ridges that we analyzed and the lack of rilles, is the gradation of lava tones within Sinus Iridum. Garfinkle says "The floor consists of lava in varying hues and levels of albedo. The patches of higher albedo materials tend to have higher crater densities than the darker areas. Patches of rays cross the sinus surface. Overall, the sinus appears slightly darker than Mare Imbrium".

The statement that the areas with lava with a higher albedo coincide with the most densely cratered areas can be analyzed with IMAGE 33, there seems to be quite a coincidence, although in part it would be due to the chain of craters that would coincide with a bright ray coming from Copernicus (actually it is not a coincidence, but both have a common origin in Copernicus). The claim that the hue of the lava within Sinus Iridum is darker than the rest of Mare Imbrium appears to be confirmed by IMAGE 34 and 35. In this issue we also include a complete analysis by Paul Walker about this subject.

Image 33, Sinus Iridum, *Ken Vaughn, Cattle Point, British Columbia, Canada. 2023 October 26 04:38 UT. 12 inch Meade LX200 GPS Schmidt-Cassegrain telescope, Astronomik 642 R-IR filter, ZWO ASI178 MM camera. Seeing 4/10, transparency 5/6.*

Image 34, Sinus Iridum, *Jean Bourgeois, Pic du Midi observatory, altitude 2877m, Pyrénées, France. 1986 January 21. 1 meter reflector telescope, f/10, Kodak TP2415 film, no post processing.*

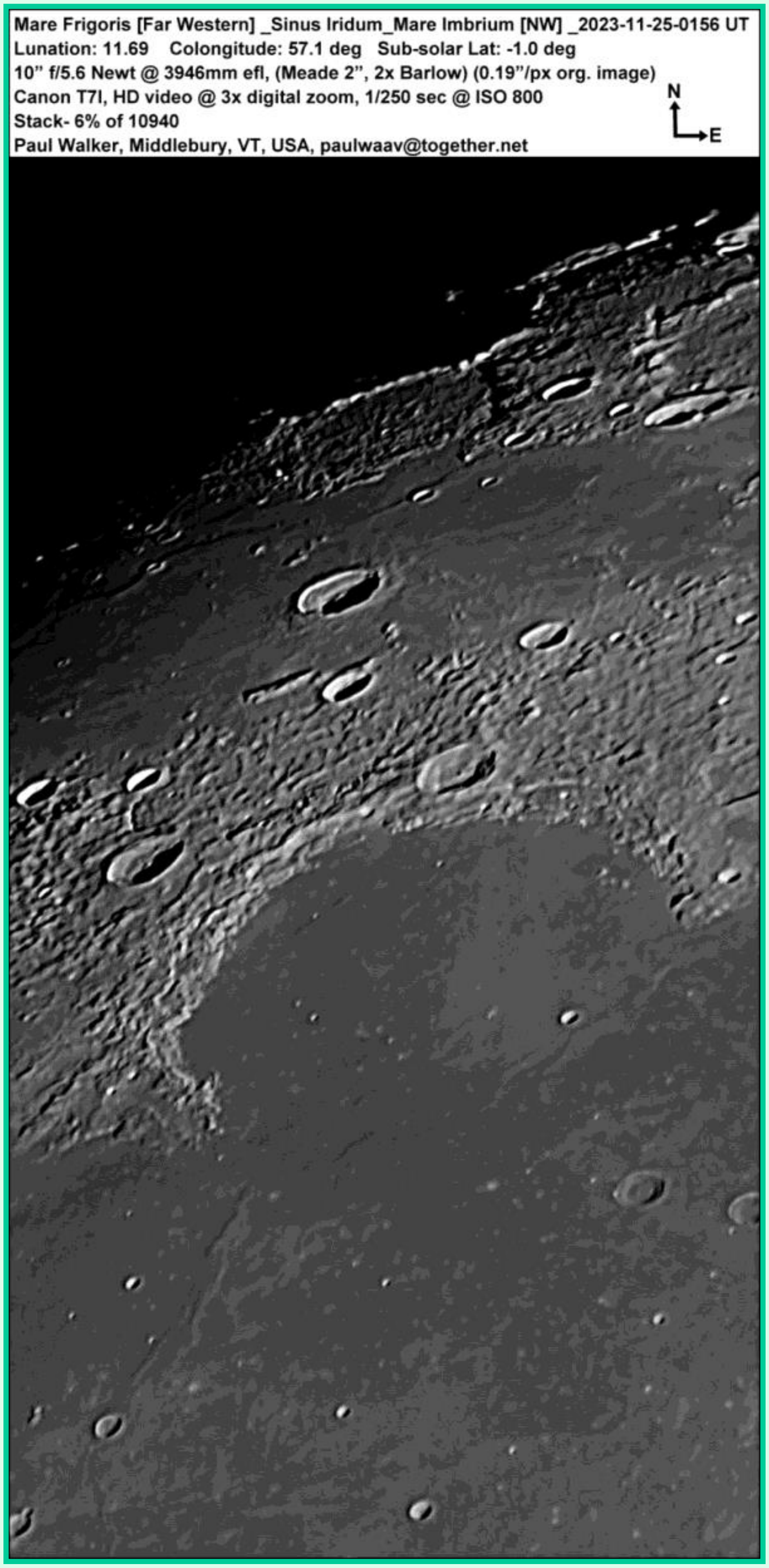
Far Western Mare Frigoris, Sinus Iridum and Northwest Mare Imbrium

Paul Walker

We start at the top right with the rim of Pythagoras at 129 km (78 mi). Top center is Babbage crater, slightly larger at 144 km (87 mi). Only parts of its rim are visible; the southeastern (near edge) forming a straight line, northern, a bit of the northwestern rim and maybe a few peaks of the southern rim. In addition, inside Babbage the top of Babbage A is just starting to catch the sun. Just in front of Babbage is South, which doesn't even look much like a crater. In the image it looks rather square. Using the Virtual Moon Atlas (VMA) in global mode and viewing from above, it still looks square. Both Babbage and South are very old. The rim between South and Babbage is slightly curved toward Babbage indicating South is younger.

The smooth region near the top, going diagonally down, right to left, is the western most part of Mare Frigoris. The conspicuous crater in the middle of it is Harpalus, it is 40 km (24 mi) across. Harpalus shows indications of an uneven mantle of material splashed out during impact. It is a fairly fresh crater. There are a few obvious wrinkle ridges on the upper edge of Frigoris and some less obvious ones to the south and east.

Sinus Iridum is the large round flat area just below the center of the image. I didn't catch it at a good sun angle. A couple wrinkle ridges are faintly visible near the upper edge. The left one is 100 m high, the right one 60 m. A couple of handfuls of craters are visible on the floor. A handful of them show shading that makes it fairly clear they are craters. The smallest of the craters are about 1.9 km across. The smallest craters visible, which only show as soft white spots, are 1.3 km, some of these appear a little bigger due to light colored halos. Some spots are smaller than 1.3 km and can be seen only because of their halos. (Measurements made with LROC QuickMap).



Focus-On: A Dream Landscape-Sinus Iridum

I was curious what the "lay of the land" was like on the floor of Sinus Iridum was like, and what that may say about where the lava came from that filled it. Using LROC QuickMap, I find that from southeast to northwest (lower right to upper left) there is slight downward slope of ~550 m over ~220 km (a mere 0.14 deg.). From southwest to northeast (lower left to upper right) it drops ~220 m over ~230 km (0.055 deg.). (See figures 2 and 3). I checked a few more cords across Iridum and saw the same results. That would indicate that at least the last lava might have been from flows that came over the rim from Imbrium. The slope would indicate that the lava was very fluid. Inside Imbrium from SW to NE (lower left to upper right), just outside of where the buried rim of Iridum is likely located, the ground has a downward slope similar to that inside Iridum.

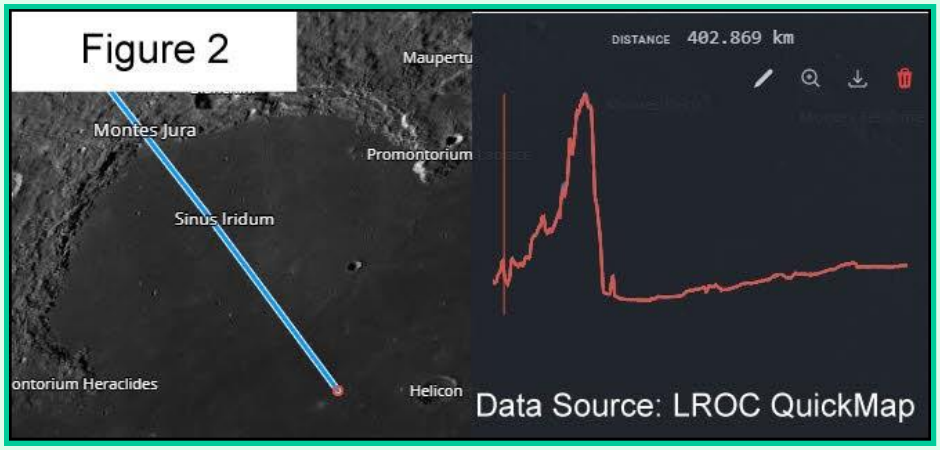
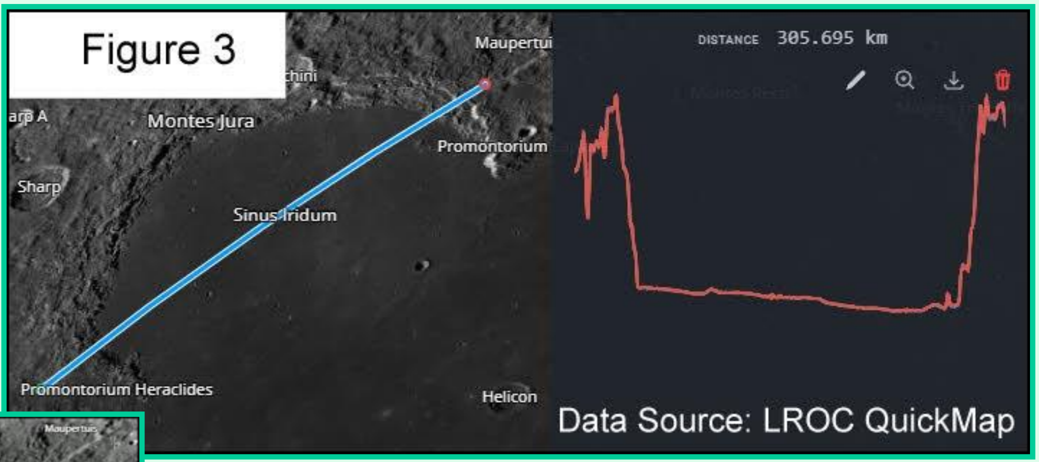


Figure 2, Sinus Iridum, *LROC QuickMap.*

Figure 3, Sinus Iridum, *LROC QuickMap.*



At the bottom of the image is Mare Imbrium (northwest edge). There are not a lot of features visible in this image. A few wrinkle ridges are can be seen. I noticed a couple rows of them between the Iridum and Imbrium basins. By applying the wrinkle ridge overlay in LROC QuickMap one can see there are 2 curved sets of ridges there. One set gently curves into the Imbrium basin seeming to follow the outline the buried rim of Iridum. The other curves into Iridum following where one would expect the edge of Imbrium to be if Iridum were absent. (see figure 4).

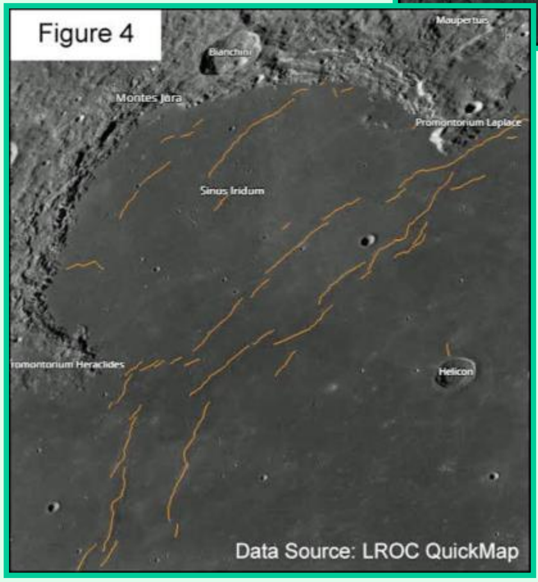


Figure 4, Sinus Iridum, *LROC QuickMap.*

Focus-On: A Dream Landscape-Sinus Iridum

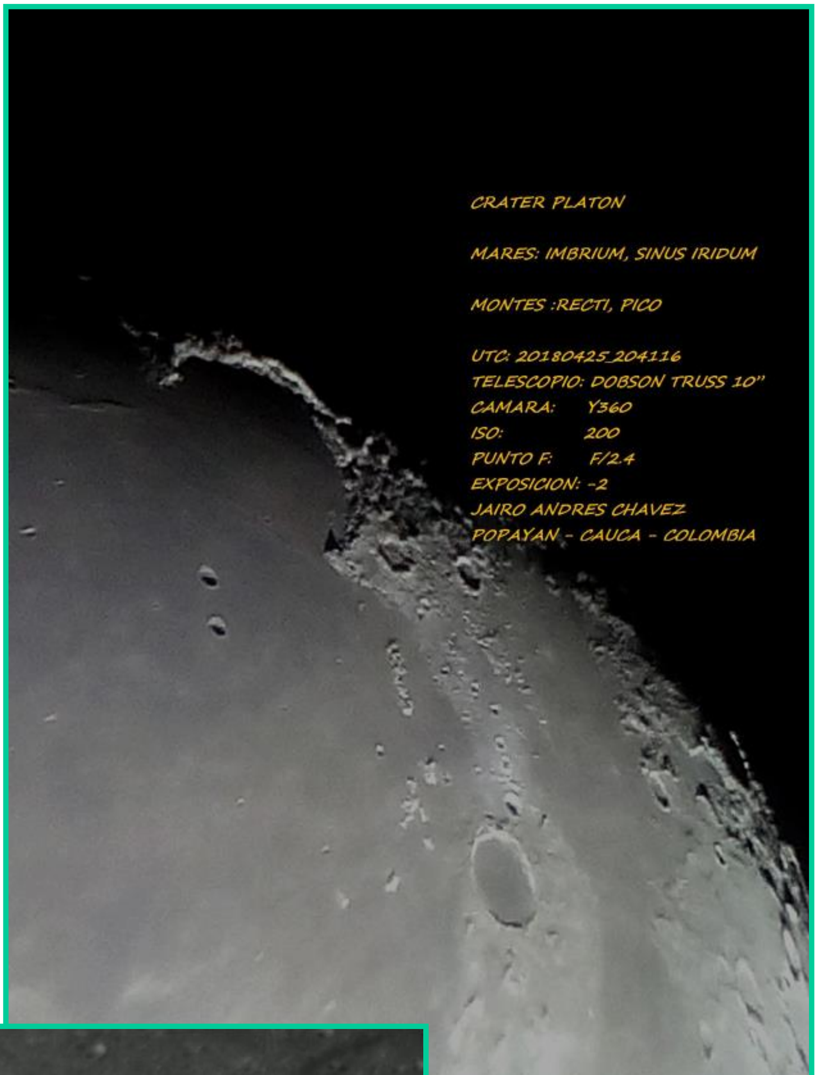


Image 35, Sinus Iridum, *Jairo Chavez, Popayán, Colombia. 2018 April 25 20:41 UT. 10 inch truss tube Dobsonian reflector telescope, Y360 camera. North is right, west is up.*

Within Sinus Iridum the lavas in the eastern part, on the Promontorium Laplace side, are much lighter than the lavas in the western part, which can be seen in IMAGES 36 to 38.

Image 36, Sinus Iridum, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2016 August 21 04:13 UT. Meade 10 inch LX200 Schmidt-Cassegrain telescope, Astronomik ProPlanet 742 nm IR-pass filter, QHY5-II camera.*

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Focus-On: A Dream Landscape-Sinus Iridum

Image 37, Sinus Iridum, *Alberto Anunziato, Paraná, Argentina. 2016 December 11 02:21 UT. Meade 10 inch LX200 Schmidt-Cassegrain telescope, Astronomik ProPlanet 742 nm IR-pass filter, QHY5-II camera.*

Image 38, Sinus Iridum, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2016 January 21 04:26 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 656.3 nm 23 filter, SKYRIS 445M camera. Seeing 7/10.*

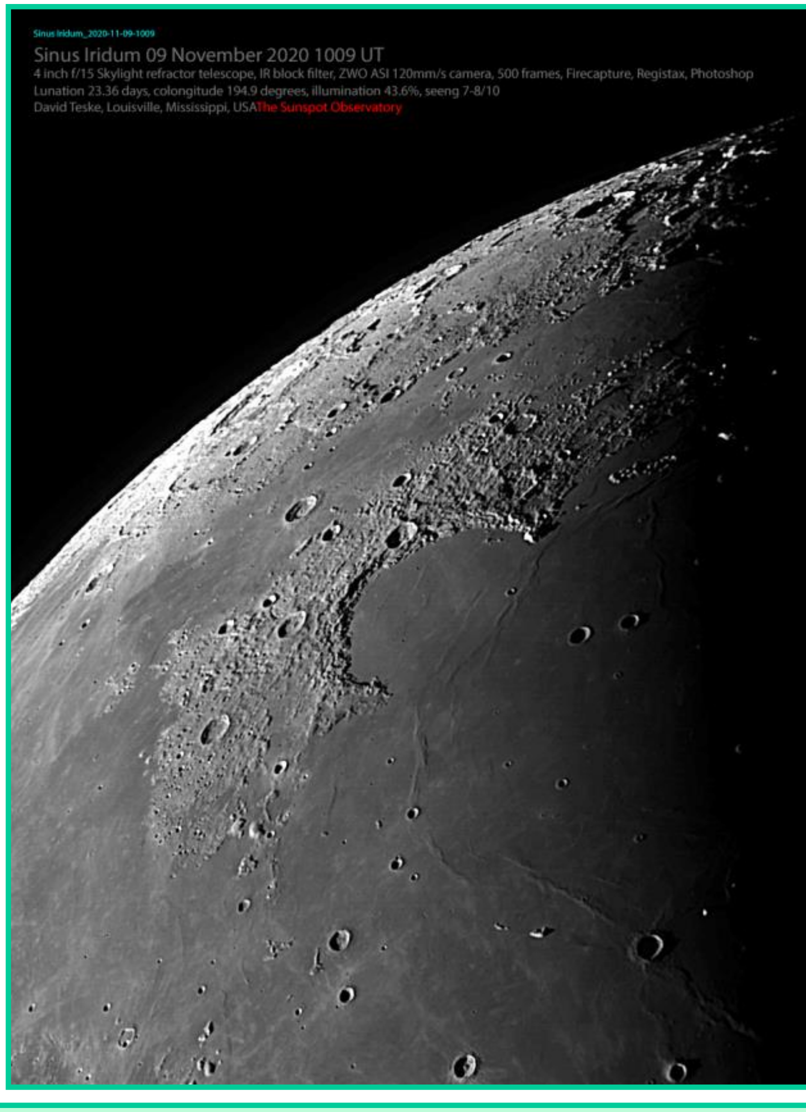
Well, we have crossed the lava oceans, with their corresponding waves, from Promontorium Heraclides, our journey ends at Promontorium Laplace, the more prominent of the two capes. The description is from Garfinkle, once again: "The rugged Promontorium Laplace stands at the northern opening of Sinus Iridum. The highest peak is about 2590 m (8497 feet) above the mare surface. The promontorium is the northeastern end of Montes Jura. On top of the promontorium is the bright rayed-cone crater Laplace D (lat. 47.27°N, long 25.58°W). The crater is about 11.1 km (6.89 miles) in diameter. Along the northeastern flank of the promontory is the peak Laplace γ (lat. 47.30°N, long 24.80°W), which rises to an elevation of 1015 m (3330 feet) above the mare surface". In IMAGE 39 we see our bay incomplete, but that makes it easier to identify the shiny walls of Promontorium Laplace. In IMAGES 40/41 you can see the craters that Garfinkle mentions at the top of Promontorium Laplace, and both images and IMAGE 42 we see how they gain in definition from bright spots to a clear relief, some small islands near the coast, on the left (west) of Promontorium Laplace. Another maritime pareidolia: "To the west of the promontory is a cluster of isolated peaks in the sinus. The largest and highest of these peaks is Laplace θ (lat. 46.40°N, long 28.80° W), which rises to an elevation of 510 m (1673 feet) above the sinus" (Garfinkle). These isolated peaks are wonderful in the IMAGE 12.

Image 39, Sinus Iridum, *Alberto Anunziato, Paraná, Argentina. 2016 April 30 05:50 UT. Meade 10 inch LX200 Schmidt-Cassegrain telescope, QHY5-II camera.*

Image 40, Sinus Iridum, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2008 March 19 05:21 UT. Celestron 14 inch Schmidt-Cassegrain telescope, 1.6x barlow, UV/IR blocking filter, SPC900NC camera. Seeing 6/10.*

Image 41, Sinus Iridum, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2016 January 21 04:26 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 656.3 nm 23 filter, SKYRIS 445M camera. Seeing 7/10.*

Image 42, Sinus Iridum, *David Teske, Louisville, Mississippi, USA. 2020 November 09 10:09 UT, colongitude 194.9°. 4 inch f/15 refractor, IR block filter, ZWO ASI120mm/s camera. Seeing 7-8/10.*



Focus-On: A Dream Landscape-Sinus Iridum

As we see a landscape of maritime evocation in which there is no water: the ocean that penetrates the interior of a bay, the waves that press against the mountainous coast, the two capes that delimit the bay and the islands near the coast. A landscape so evocative that it has not left indifferent science fiction writers such as Arthur C. Clarke in his novel "Earthlight", which narrates a sports competition that takes place in our area: “Eons ago the Sinus Iridum had been a complete ring mountain--one of the largest walled-plains on the Moon. But the cataclysm which had formed the Sea of Rains had destroyed the whole of the southern wall, so that only a semicircular bay is now left. Across that bay Promontory Laplace and Promontory Heraclides stare at each other, dreaming of the day when they were linked by mountains four kilometers high. Of those lost mountains, all that now remain are a few ridges and low hillocks (…) He remembered his first glimpse of the Sinus Iridum, through the little homemade telescope he had built when he was a boy. It had been nothing more than two small lenses fixed in a cardboard tube, but it had given him more pleasure than the giant instruments of which he was now the master”.

Let's hope that this tour of the wonderful images of our friends at ALPO will help to make more sophisticated the elemental pleasure that Clarke narrates and that we all experienced the first times we saw through the eyepiece of a Sinus Iridum telescope. Will we explore Sinus Iridum? This area has not been visited by any probe, probably because it is so far north, with the Apollo 15 landing site being the closest area explored (more than a thousand kilometers away). Despite that, the Chinese space agency considered back in 2013 that the Sinus Iridum region is one of the important candidate landing areas for the future Chinese lunar robotic and human missions. Considering its flat topography, abundant geomorphic features and complex evolutionary history, it could have been the landing site of the Chang'e 3 mission.

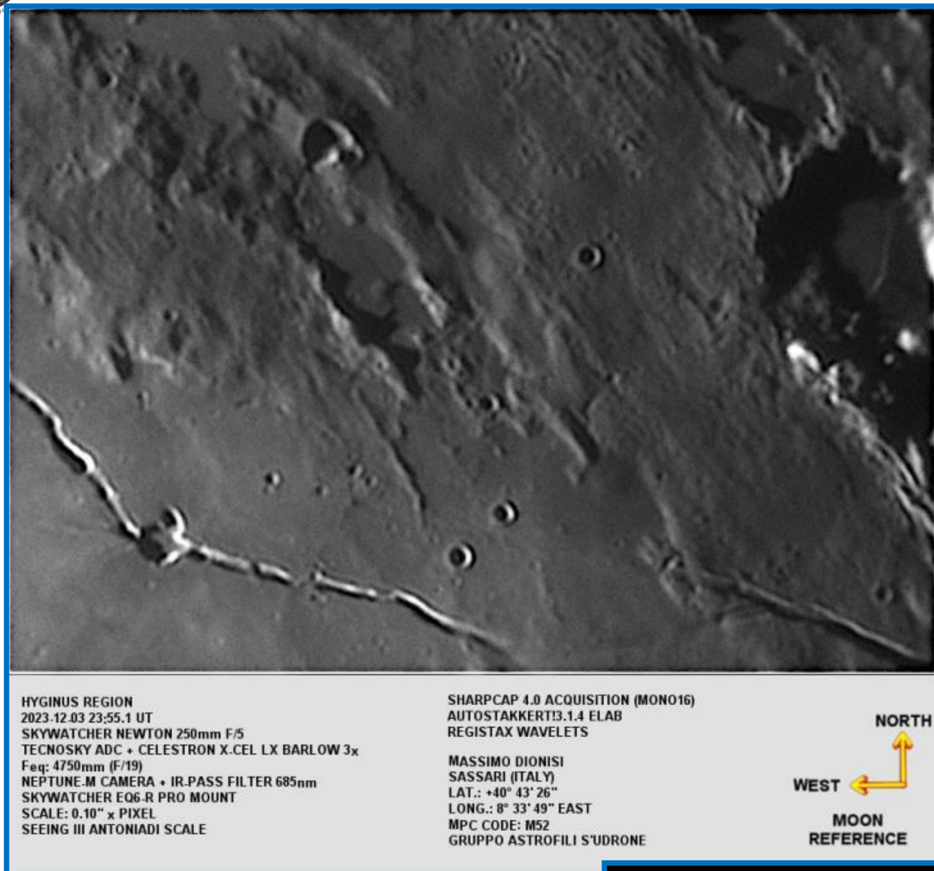
BIBLIOGRAPHY:

Garfinkle, Robert (2020), Luna Cognita, Springer, New York.

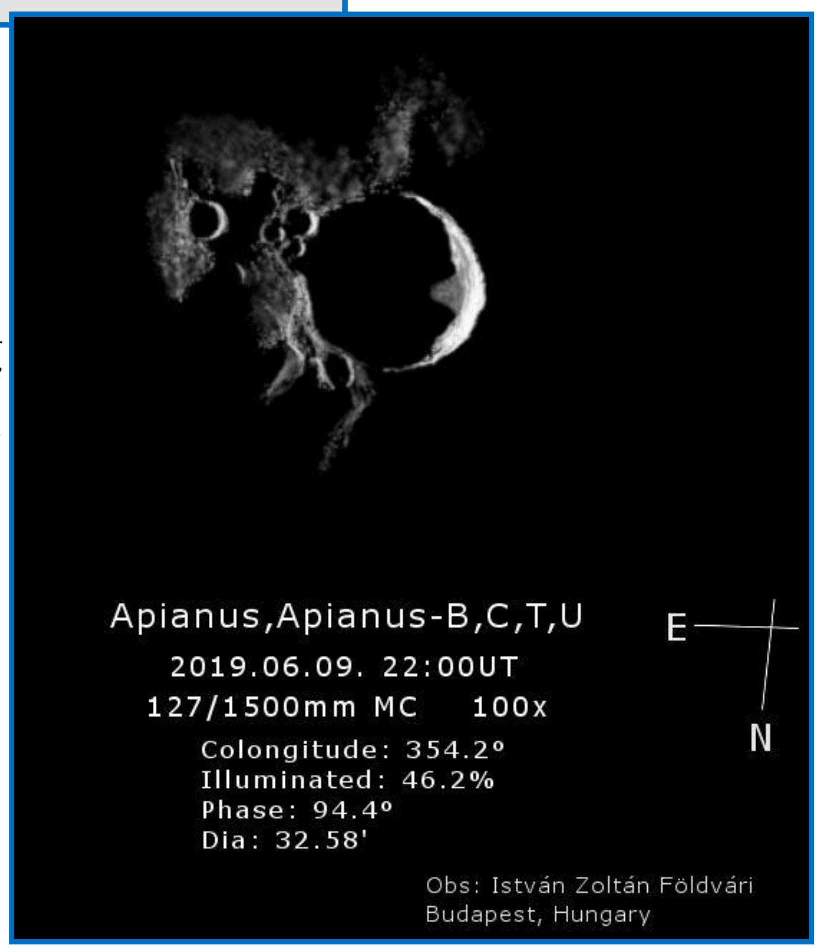
Grego, Peter (2005), The Moon and How To Observe It, Springer.

Wood, Charles A. (2003), The Modern Moon. A Personal View, Sky and Telescope, Cambridge.

Wood, Charles A. (2006), Out the porthole, in https://www2.lpod.org/wiki/August_20,_2006



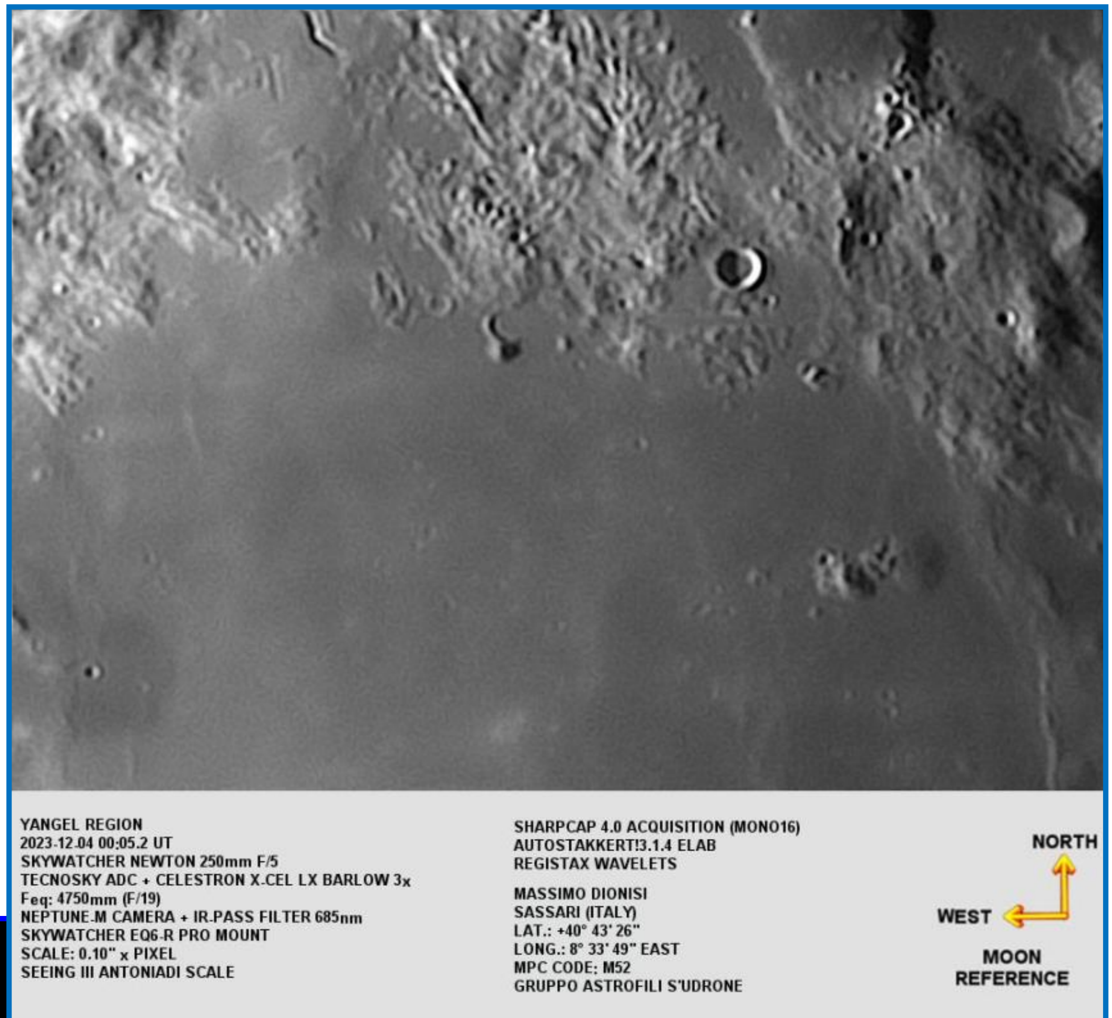
Hyginus, *Massimo Dionisi, Sassari, Italy. 2023 December 03 23:55 UT. Skywatcher 10 inch f/5 Newtonian reflector telescope, Tecnosky ADC, Celestron X-cel LX Barlow 3x, fl 4,750 mm, IR Pass filter 685 nm, Neptune-M camera. Seeing III Antoniadi Scale.*

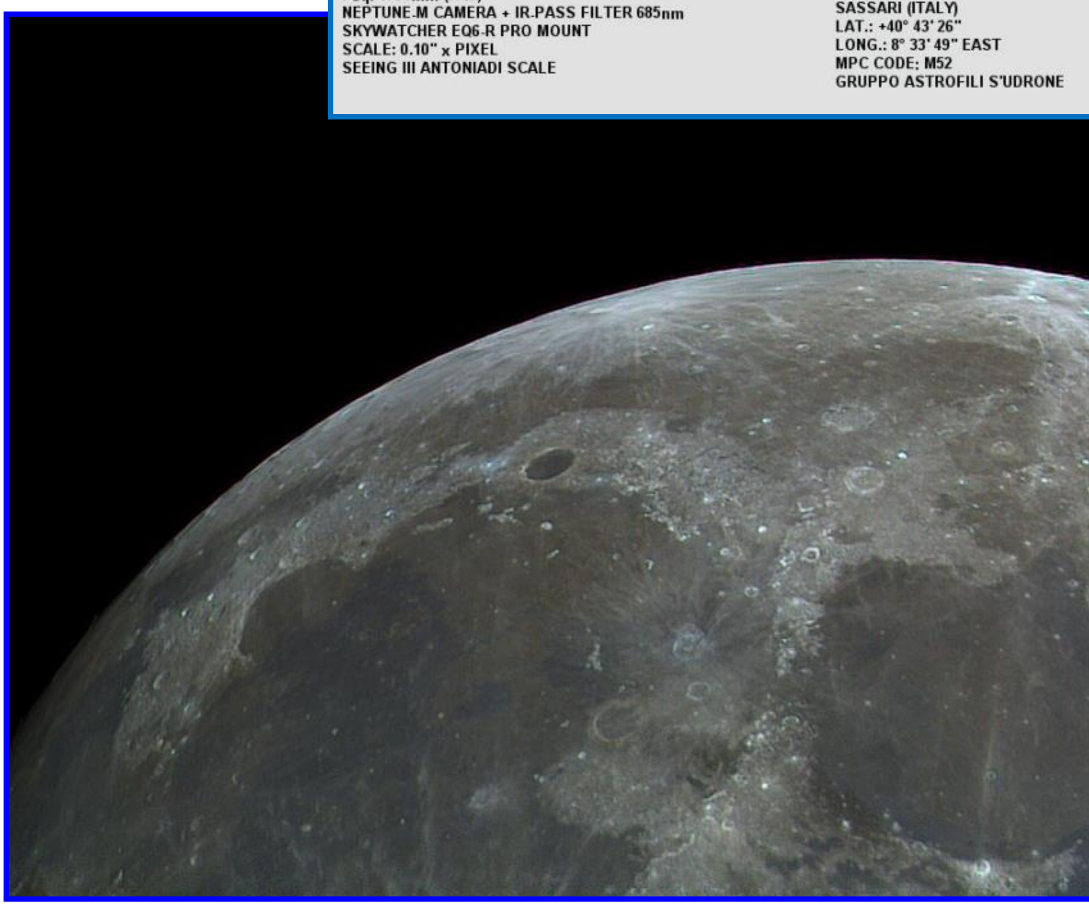


Apianus, *István Zoltán Földvári, Budapest, Hungary. 2019 June 09 21:40-22:07 UT, colongitude 354.2º. 127 mm Maksutov-Cassegrain telescope, 1500 mm focal length, 100x. Seeing 8/10, transparency 5/6.*

Recent Topographic Studies

***Yangel'**, Massimo Dionisi, Sassari, Italy. 2023 December 04 00:05 UT. Skywatcher 10 inch f/5 Newtonian reflector telescope, Tecnosky ADC, Celestron X-cel LX Barlow 3x, fl 4,750 mm, IR Pass filter 685 nm, Neptune-M camera. Seeing III Antoniadi Scale.*





***Plato**, Walter Ricardo Elias, Oro Verde, Argentina, AEA. 2023 December 26 00:45 UT. Sky Watcher 150 mm reflector telescope, QHY5-II-C camera.*

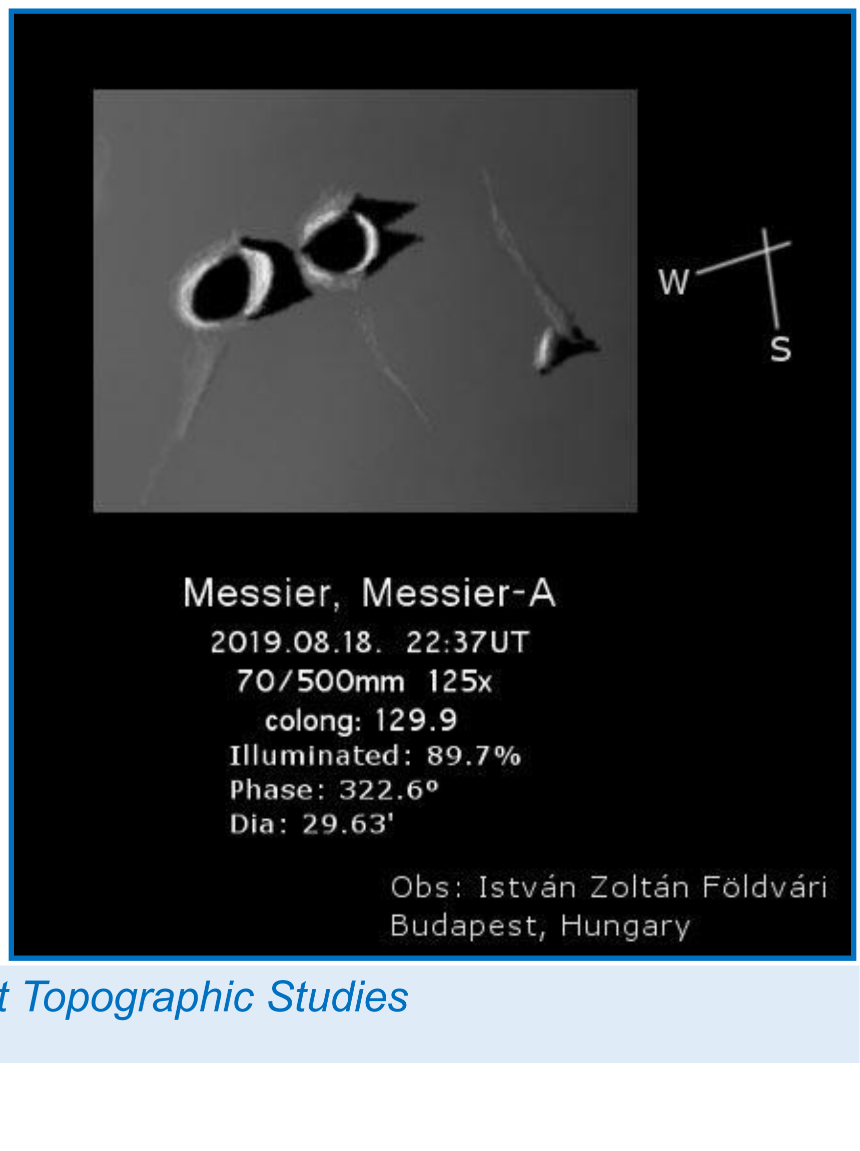
Recent Topographic Studies

Manilius, *Massimo Dionisi, Sassari, Italy. 2023 December 03 23:45 UT. Skywatcher 10 inch f/5 Newtonian reflector telescope, Tecnosky ADC, Celestron X-cel LX Barlow 3x, fl 4,750 mm, IR Pass filter 685 nm, Neptune-M camera. Seeing III Antoniadi Scale.*

Janssen, *Kaan Gökçeli, Istanbul, Turkey. 2023 December 29 23:06 UT. Bresser 150/750 reflector telescope, Svbony SV213 barlow lens, ZWO ASI120MC-S camera.*

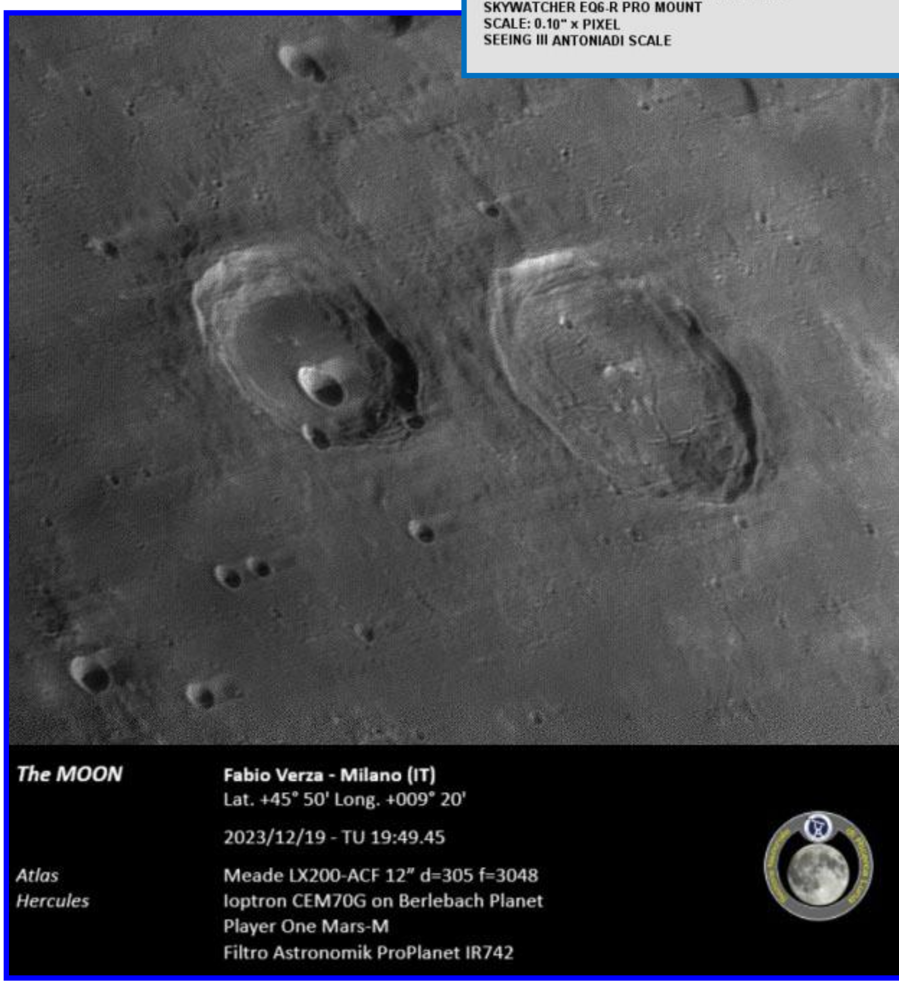
Cleomedes, *Kaan Gökçeli, Istanbul, Turkey. 2023 December 29 23:09 UT. Bresser 150/750 reflector telescope, Svbony SV213 barlow lens, ZWO ASI120MC-S camera.*

Messier, *István Zoltán Földvári, Budapest, Hungary. 2019 August 18 22:35-22:50 UT, colongitude 129.9º. 70 mm refractor telescope, 500 mm focal length, 125x. Seeing 7/10, transparency 4/6.*



Recent Topographic Studies

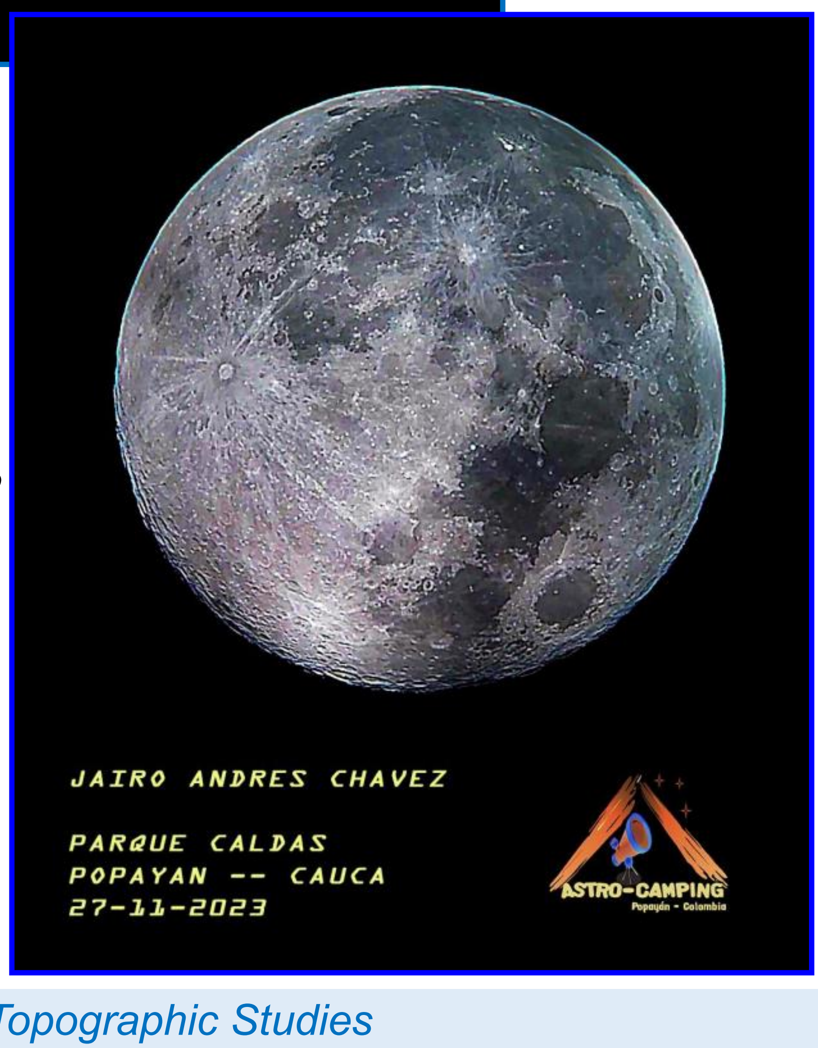
Manilius, *Massimo Dionisi, Sassari, Italy. 2023 December 03 23:49 UT. Skywatcher 10 inch f/5 Newtonian reflector telescope, Tecnosky ADC, Celestron X-cel LX Barlow 3x, fl 4,750 mm, IR Pass filter 685 nm, Neptune-M camera. Seeing III Antoniadi Scale.*



Atlas, *Fabio Verza, Milan, Italy SNdR. 2023 December 19 19:49 UT. Meade LX200 ACF 12 inch Schmidt-Cassegrain telescope, Astronomik ProPlanet IR742 nm filter, Player One Mars M camera.*

Recent Topographic Studies

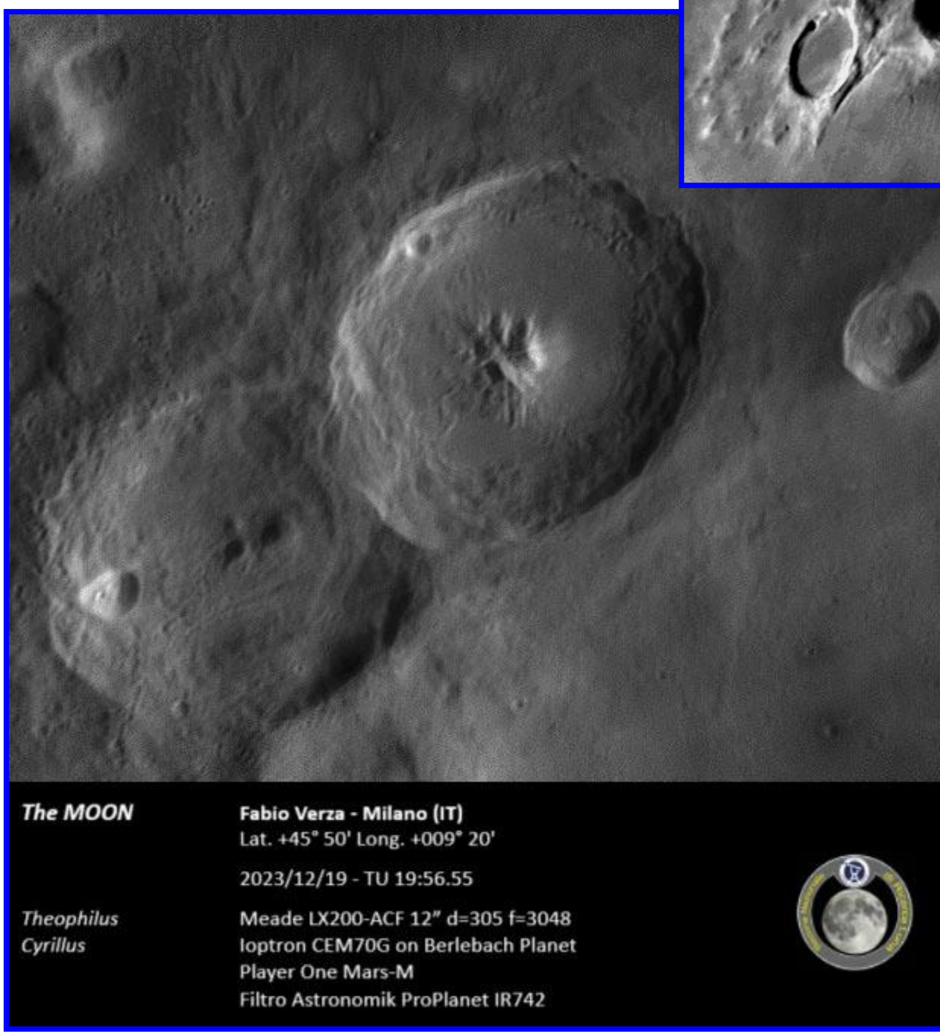
***de la Rue,** István Zoltán Földvári, Budapest, Hungary. 2019 August 18 22:52-23:17 UT, colongitude 130.1º. 70 mm refractor telescope, 500 mm focal length, 125x. Seeing 7/10, transparency 5/6.*



***Waning Gibbous Moon,** Jairo Chavez, Popayán, Colombia. 2023 November 28 02:27 UT. 311 mm truss tube Dobsonian reflector telescope, MOTO E5 PLAY camera. North is right, west is up.*

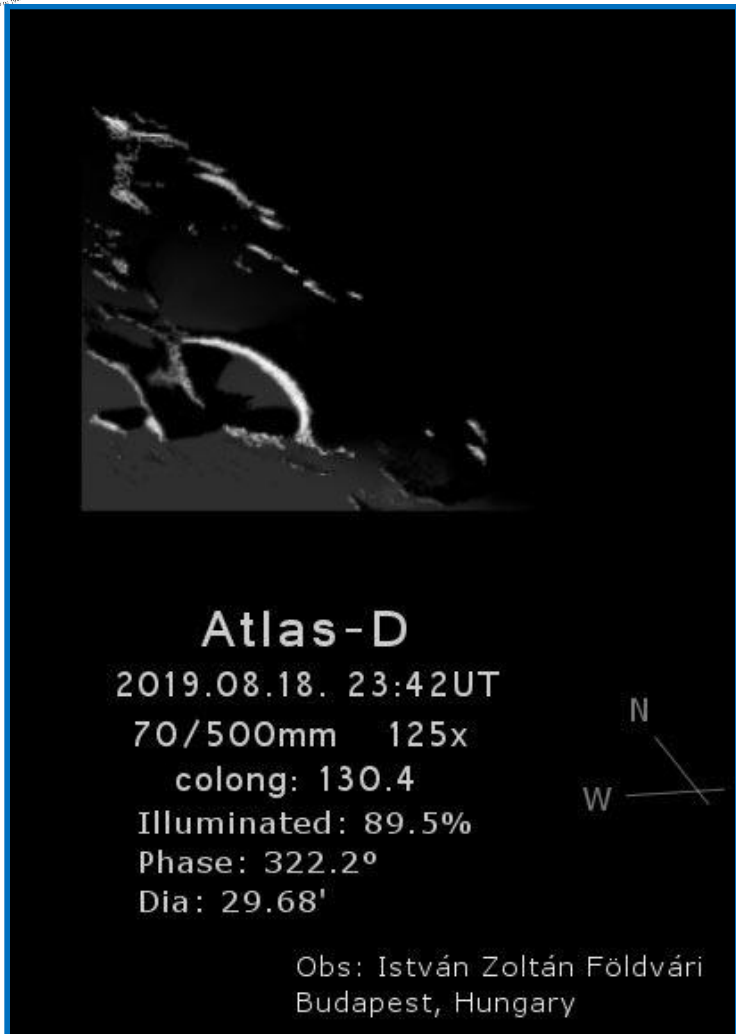
Recent Topographic Studies

Aristarchus, *KC Pau, Hong Kong, China. 2023 December 07 22:11 UT. 10 inch f/6 Newtonian reflector telescope, 2.5x barlow, QHYCCD290M camera.*

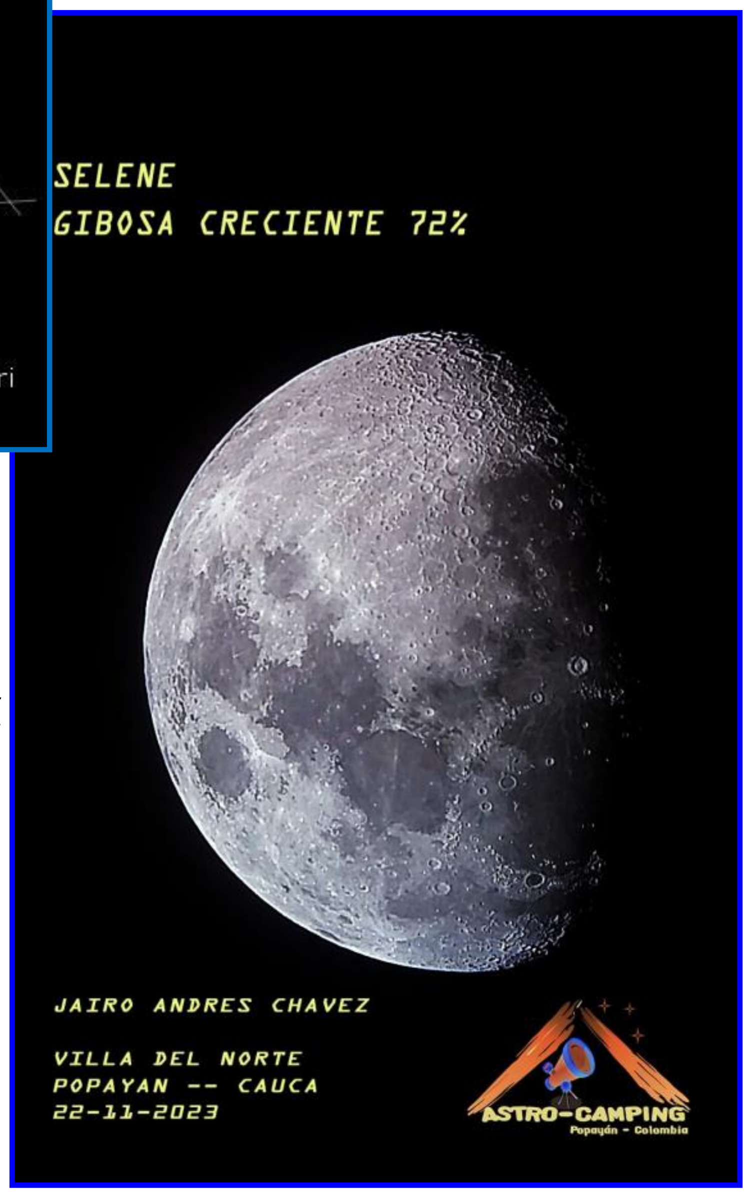


Theophilus, *Fabio Verza, Milan, Italy SNdR. 2023 December 19 19:56 UT. Meade LX200 ACF 12 inch Schmidt-Cassegrain telescope, Astronomik ProPlanet IR742 nm filter, Player One Mars M camera.*

Recent Topographic Studies



Atlas-D, *István Zoltán Földvári, Budapest, Hungary. 2019 August 18 23:20-23:49 UT, colongitude 130.4º. 70 mm refractor telescope, 500 mm focal length, 125x. Seeing 7/10, transparency 5/6.*



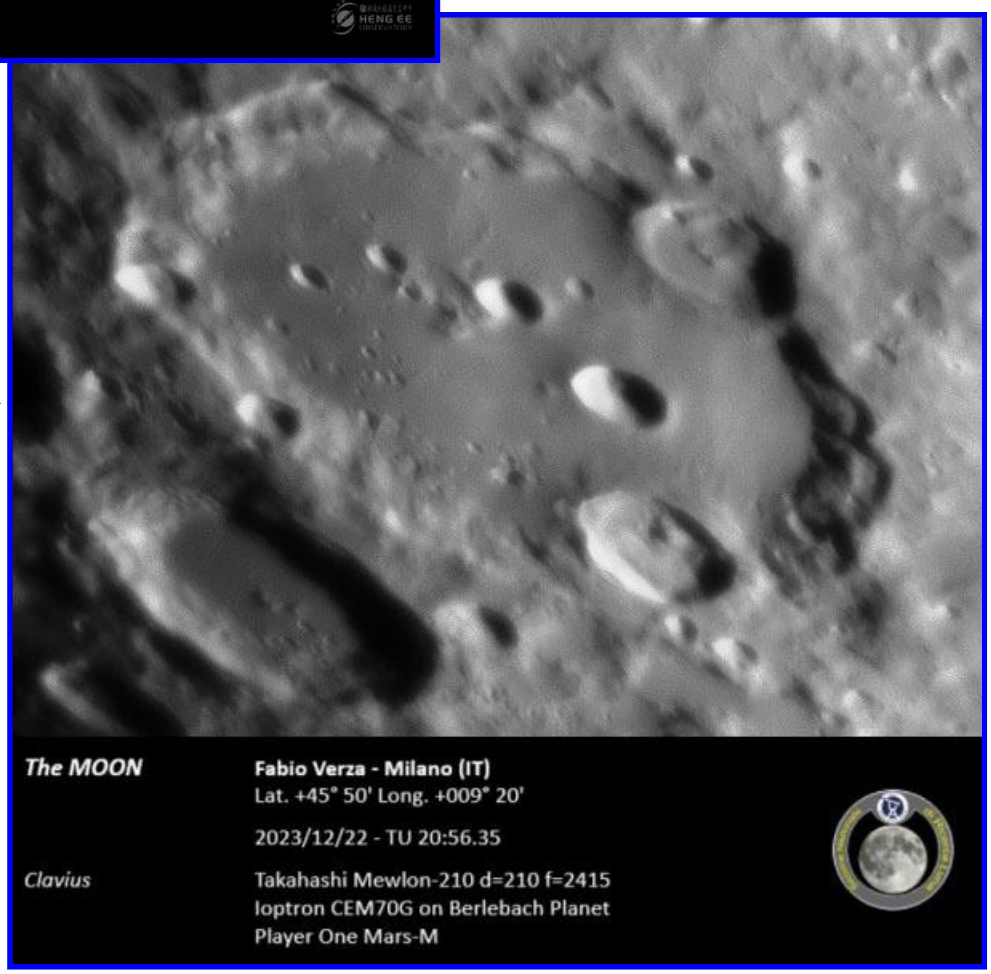
Waxing Gibbous Moon, *Jairo Chavez, Popayán, Colombia. 2023 November 24 00:19 UT. 311 mm truss tube Dobsonian reflector telescope, MOTO E5 PLAY camera. North is down, west is right.*

Recent Topographic Studies

Licetus, *KC Pau, Hong Kong, China. 2023 December 19 11:48 UT. 10 inch f/6 Newtonian reflector telescope, 2.5x barlow, QHYCCD290M camera.*

Aristoteles, *Fabio Verza, Milan, Italy SNdR. 2023 December 19 19:19 UT. Meade LX200 ACF 12 inch Schmidt-Cassegrain telescope, Astronomik ProPlanet IR742 nm filter, Player One Mars M camera.*

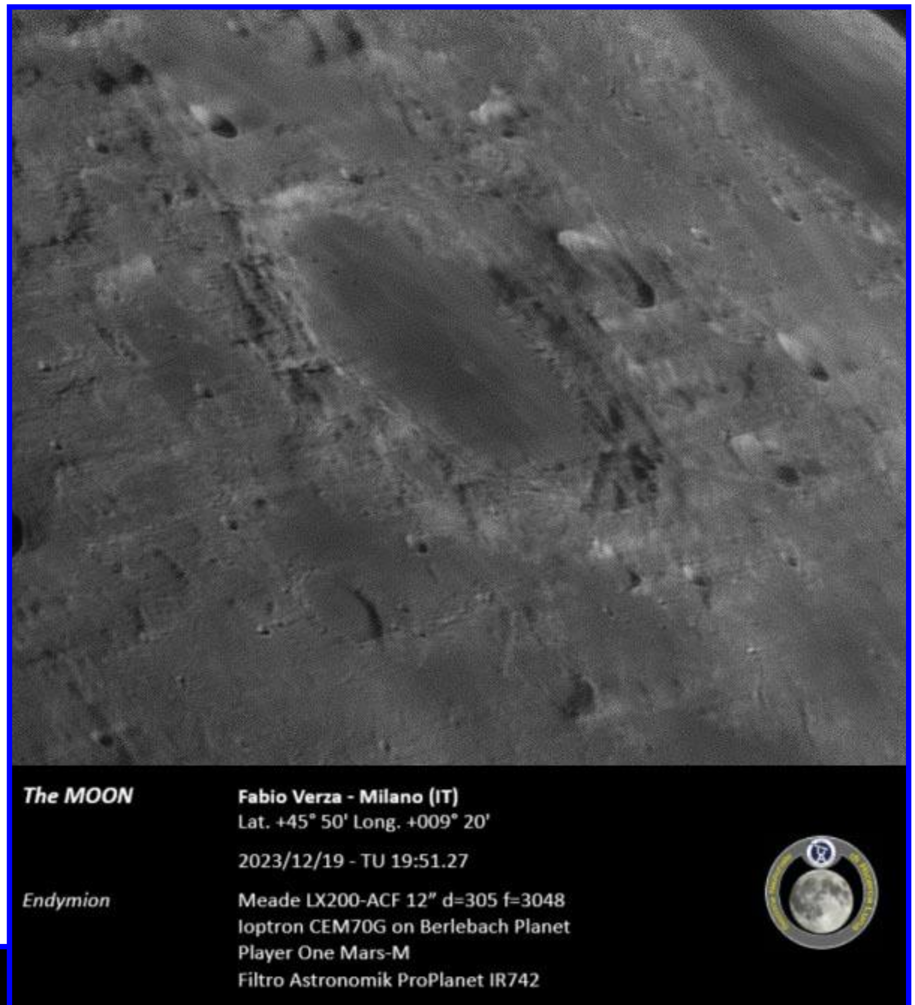
Waxing Gibbous Moon, *Michael Teoh, Penang Malaysia. 2023 December 22 12:37 UT. APM-TMB 228/2050 refractor telescope, QHY5III678M camera, 16 panel mosaic.*



Clavius, *Fabio Verza, Milan, Italy SNdR. 2023 December 22 20:56 UT. Takahashi 10 mm Mewlon Dall-Kirkham telescope, Player One Mars M camera.*

Recent Topographic Studies

Endymion, *Fabio Verza, Milan, Italy SNdR. 2023 December 19 19:51 UT. Meade LX200 ACF 12 inch Schmidt-Cassegrain telescope, Astronomik Pro-Planet IR742 nm filter, Player One Mars M camera.*



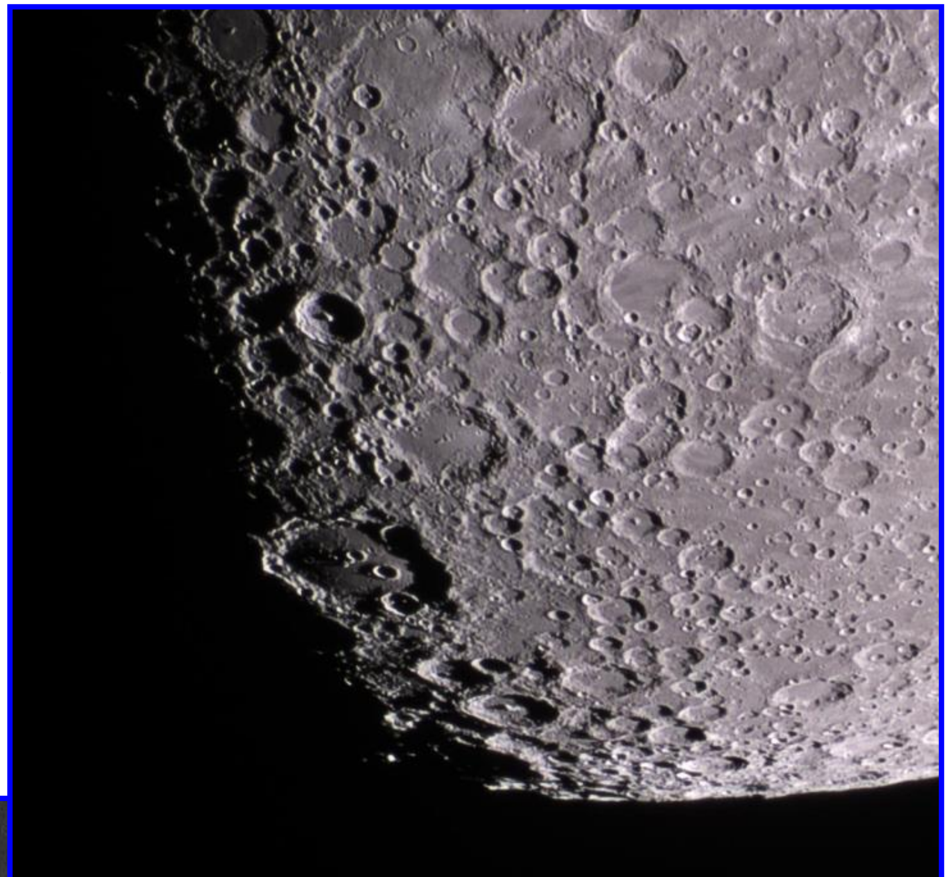
Plato, *Maurice Collins, North Palmerston North, New Zealand. 2023 December 21 08:58 UT. Sky Watcher Espirt 80 mm f/5 refractor telescope, 3 x barlow, efl 1,200 mm, QHY5III462C camera.*

Recent Topographic Studies

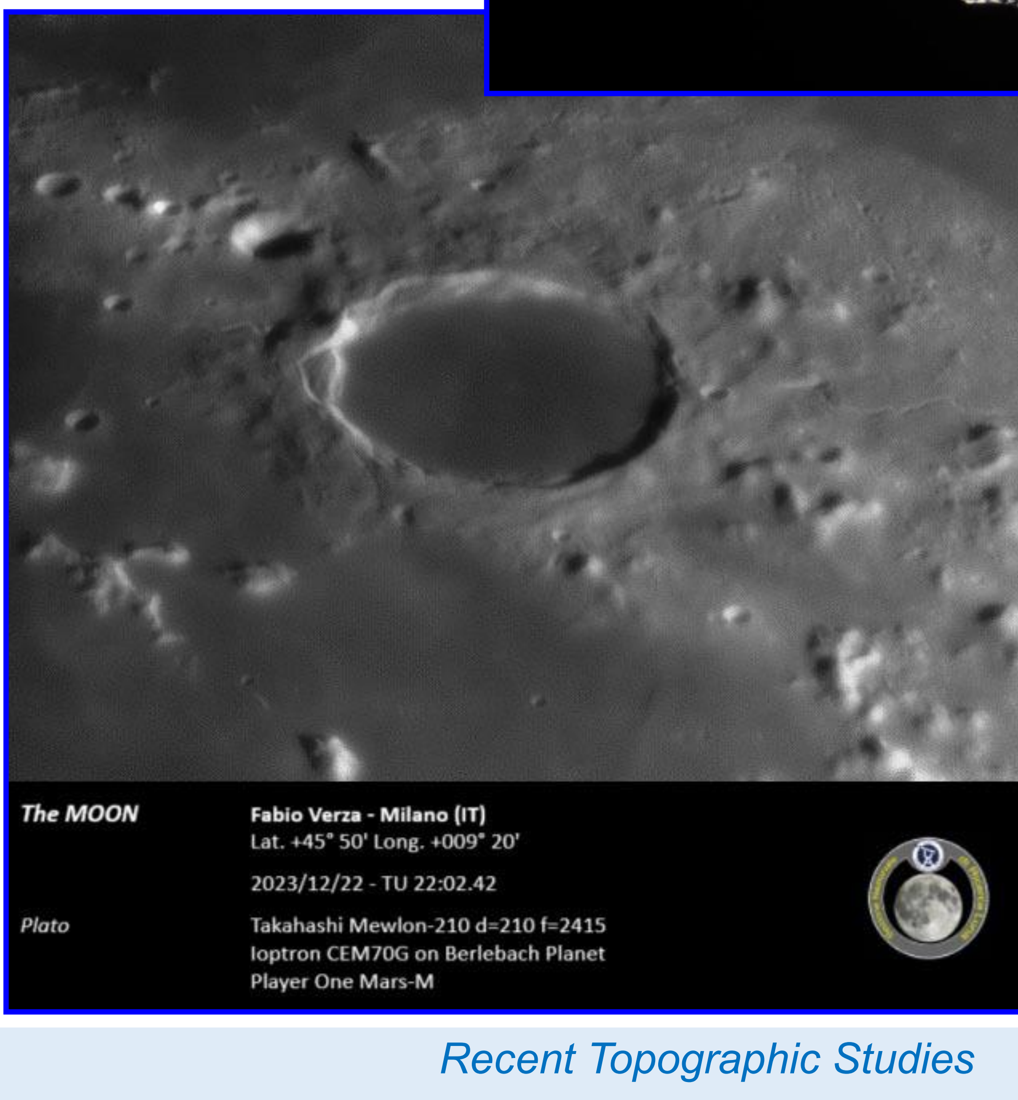
8.4 day-old Moon, *Maurice Collins, North Palmerston North, New Zealand. 2023 December 21 08:43-08:47 UT. Sky Watcher Espirt 80 mm f/5 refractor telescope, 3 x barlow, efl 1,200 mm, QHY5III462C camera.*

Copernicus, *Fabio Verza, Milan, Italy SNdR. 2023 December 22 20:32 UT. Takahashi 210 mm Mewlon Dall-Kirkham telescope, Player One Mars M camera.*

Recent Topographic Studies



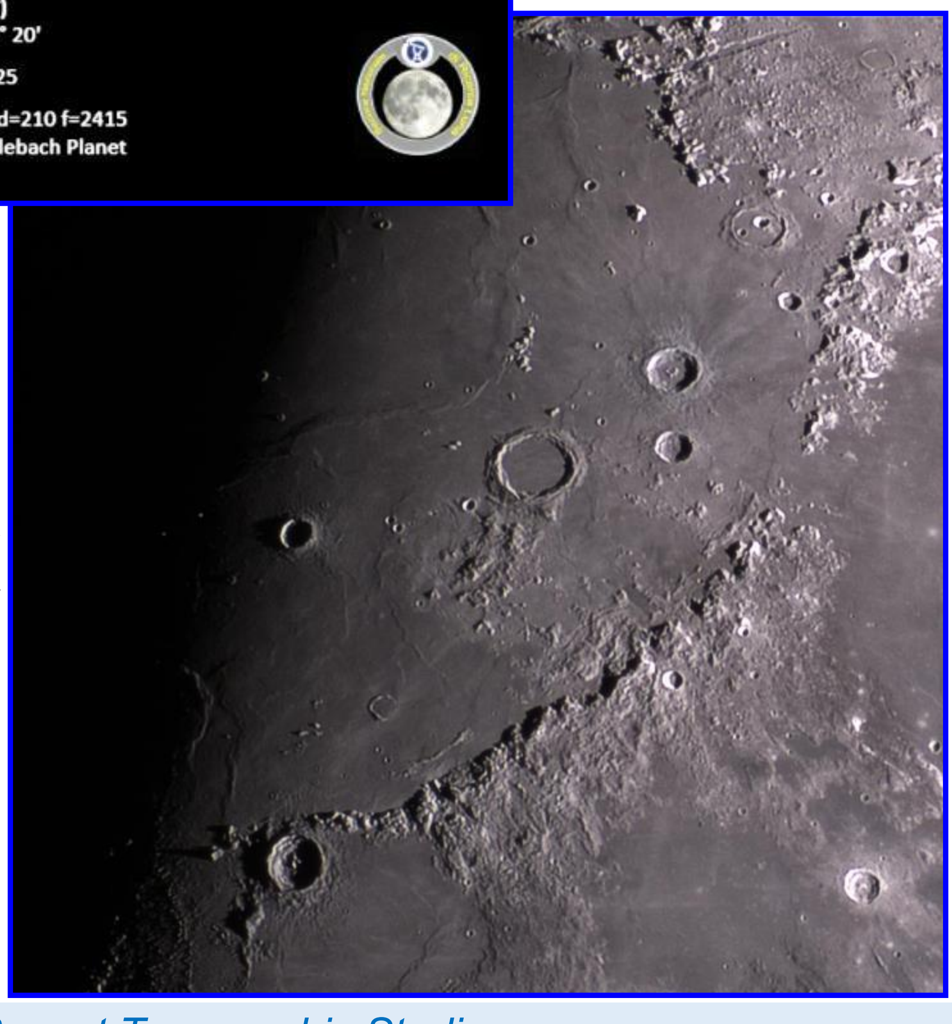
Clavius, *Maurice Collins, North Palmerston North, New Zealand. 2023 December 21 09:04 UT. Sky Watcher Espirt 80 mm f/5 refractor telescope, 3 x barlow, efl 1,200 mm, QHY5III462C camera.*



Plato, *Fabio Verza, Milan, Italy SNdR. 2023 December 22 22:02 UT. Takahashi 210 mm Mewlon Dall-Kirkham telescope, Player One Mars M camera.*

Recent Topographic Studies

***Ramsden,** Fabio Verza, Milan, Italy SNdR. 2023 December 22 22:01 UT. Takahashi 210 mm Mewlon Dall-Kirkham telescope, Player One Mars M camera.*



***Archimedes,** Maurice Collins, North Palmerston North, New Zealand. 2023 December 21 08:59 UT. Sky Watcher Espirt 80 mm f/5 refractor telescope, 3 x barlow, efl 1,200 mm, QHY5III462C camera.*

Recent Topographic Studies

Kepler, *Walter Ricardo Elias, Oro Verde, Argentina, AEA. 2023 December 30 03:44 UT. Sky Watcher 150 mm reflector telescope, QHY5-II-C camera.*

Janssen, *Kaan Gökçeli, Istanbul, Turkey. 2023 December 29 23:05 UT. Bresser 150/750 reflector telescope, Svbony SV213 barlow lens, ZWO ASI120MC-S camera.*

Recent Topographic Studies

Lunar Geologic Change Detection Program

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

2024 January

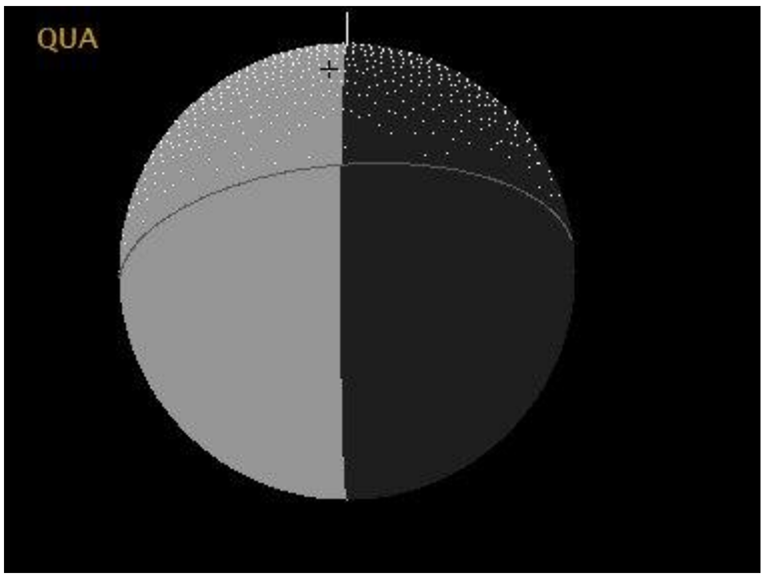


Figure 1. *A lunarscan display of the predicted impact distribution of Quadrantid meteoroids on the Moon at 06:30UT on 2024 Jan 04.*

News: Please keep a look out for Quadrantid meteors impacting the earthshine part of the Moon on 2024 Jan 03-05, though the peak will be on Jan 04 UT 06:30 ± 1 days. Note that any Quadrantid impacts will be more likely to be seen on the upper northern hemisphere/N-NE limb. From Earth the ZHR rate is 80+, so your chances of detecting an impact flash in the lunar earthshine are not too dissimilar to other major showers such as the Geminids or Perseids, and also the velocity of the meteoroids, at 40 km/s is favorable. Just think a 1g mass meteoroid striking the Moon at this speed would release 0.8 million Joules of energy!

Its best to use a camera running at least 10 frames per sec and ideally 20-30 or faster. You can use software such as ALFI or FDS to search for the short < 0.1 sec impact flashes, after, and in the case of FDS during the recording of the video. Try to keep sunlit peaks out of the field of view if possible. Please send any detections of impact flashes to ALPO's Impact Flash coordinator, Brian Cudnik (bmcudnik @ gmail.com), or to myself (atc @ aber.ac.uk) or at the very least let us know the date of your observations and the start and end UTs, even if you detect no flashes. Try also to video some stars near the Moon, especially occultations, as these are useful to calibrate any impact flashes against.

LTP Reports: No LTP reports were received for November, but on 2023 Dec 15 UT 21:27-22:20 Lawrence Garrett (Fairfax, VT, USA) was making visual observations of the earthshine part of the Moon. He had intended to do some CCD video of impact flashes, but in view of the Moon's low altitude, limited time available, and threat of cloud, he decided to stick to visual observing using his 6" f/8 reflector at x72. At least 9 flashes were seen in earthshine, one on the terminator and one on the bright lunar disk – however these were all pin-point in size and so dismissed as cosmic rays. However, four more notable flashed were seen, as shown in Fig 2. Flash #1 seen at 21:47:28UT a gray flash and larger than typical pin-point cosmic rays. Flash #2 seen at 21:53:12UT a gray flash and larger than typical pin point cosmic rays. Flash #3 seen at 21:57:00UT ±2 sec a gray flash and larger than a typical pin point cosmic ray. Flash #4 seen at 22:05:54UT±2 sec appeared as a=a white flash near the limb and was the brightest of all the flashes seen that evening. It was one of six limb flashes seen but was the only one noticed without averted (side) vision.

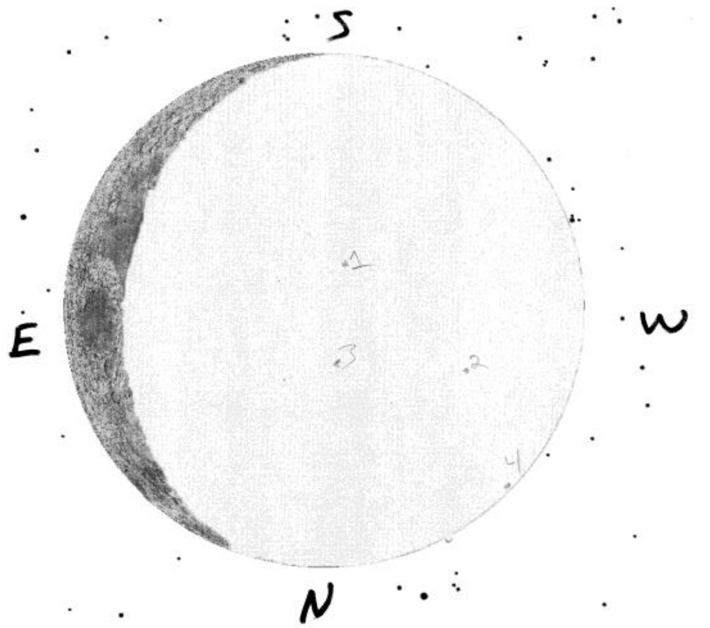


Figure 2. *A sketch of the locations of four candidate impact flashes seen visually on the Moon by Laurence Garrett on 2023 Dec 15. The Moon's orientation is as depicted by the annotation. This is a "negative" or inverted gray-tone image i.e. dark is bright and bright is dark.*

Visual sightings of possible impact flashes have been seen before – many are listed in the LTP catalog, and Brian Cudnik of ALPO has seen some too. However, it's really important that we get confirmation, either a second video report or a video capture. So, if anybody else was observing earthshine, in a similar longitude range to Vermont, please get in touch.

Routine reports received for October included: Alberto Anunziato (Argentina – SLA) observed: Aristarchus, Mare Crisium and Torricelli B. Massimo Alessandro Bianchi (Italy – UAI) imaged: Cyrillus. Robert Bowen (Mid Wales, UK) imaged: several features. Maurice Collins (New Zealand - ALPO/BAA/RASNZ) imaged: Aristarchus, Bailly, Oceanus Procellarum, and several features. Valerio Fontani (Italy – UAI) imaged: Copernicus, Deslandres, and Lansberg. Les Fry (West Wales, UK – NAS) imaged: Aristarchus, Atlas, Gassendi, Janssen, Marius, Nearch, Palus Somni, Rheita, Schickard and Schiller. Bill Leatherbarrow (Sheffield, UK – BAA) imaged: Aristarchus, Balmer, Langrenus, Mare Crisium, Messala, and Petavius. Chris Longthorn (UK – BAA) imaged: several features. Aldo Tonon (Italy – UAI) imaged: Cyrillus. Ivan Walton (UK - BAA) imaged: Delsandres and Littrow.

Analysis of Reports Received (November):

On 2023 Nov 18 Alberto Anunziato (SLA) observed visually this crater under similar illumination to the following report:

On 1983 Feb 18 at 19:00?UT P.W. Foley (Kent, UK) noted that the southern Mare Crisium appeared to be obscured by a pale gray haze. Cameron 2006 catalog extension ID=205 and weight=3. ALPO/BAA weight=2.

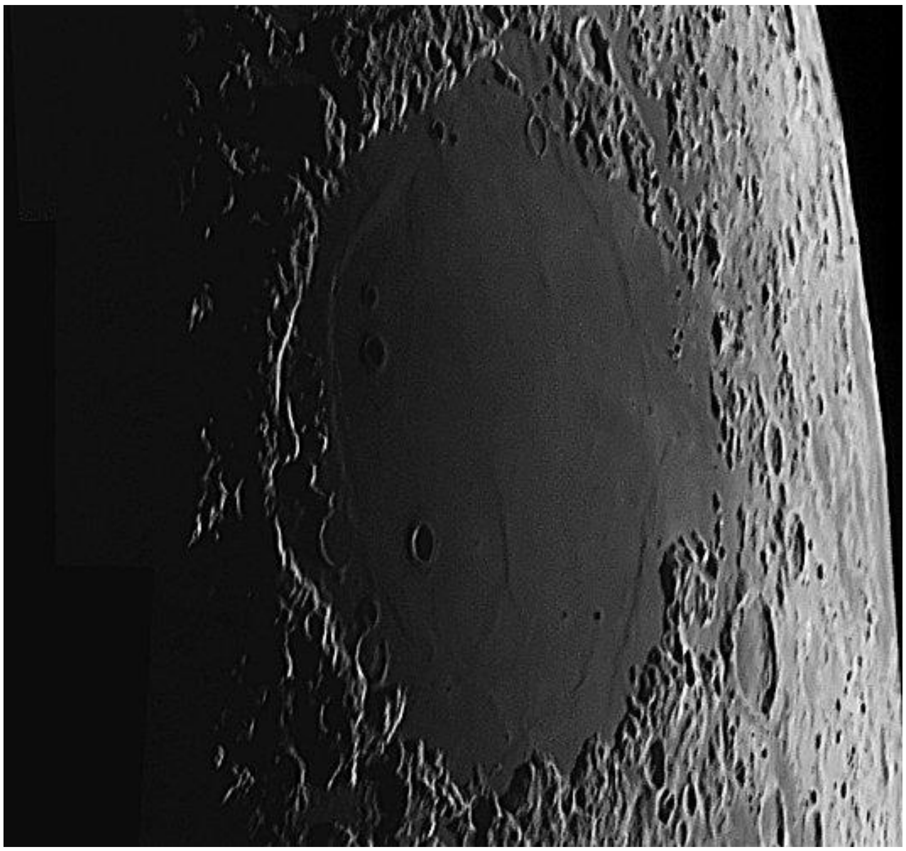


Figure 3. *Mare Crisium on 2018 Apr 19 UT 02:09 as imaged by Rik Hill (ALPO/BAA) and orientated with north towards the top.*

Alberto was using a 105 mm. Maksutov-Cassegrain (Meade EX 105) with a magnification of x154 and commented that he could see no pale gray haze in the southern part of Mare Crisium. Just out of interest I searched the ALPO/BAA observational database for similar illumination images and came up with this nice one by Rik Hill (See Fig 3) which also shows the southern part of Mare Crisium to appear normal. We shall leave the weight of the 1983 report at 2 for now.

Cyrillus: On 2023 Nov 19 UAI observers: Massimo Alessandro Bianchi at 17:24 & 17:26UT and Aldo Tonon at 17:37UT imaged this crater for the following lunar schedule request:

BAA Request: Cyrillus. There is a small white craterlet just north of the three central peaks. We are interested to receive high resolution images of this in order to find out at what selenographic colongitude, in the lunar evening, that it loses its white spot appearance. Please use scopes larger than 5 inches in diameter. Please email these to: a t c @ a b e r . a c . u k

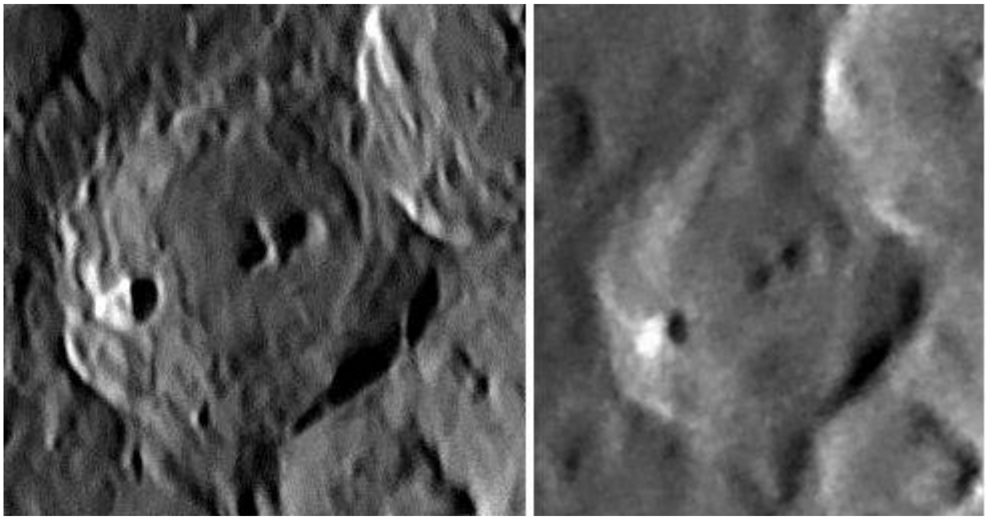


Figure 4. *Cyrillus on 2023 Nov 19 imaged by UAI observers and orientated with north towards the top.* ***(Left)*** *by Massimo Alessandro Bianchi at 17:24 UT.* ***(Right)*** *by Aldo Tonon at 17:37 UT.*

No sign of the white spot can be seen north of the three central peaks in Fig 4. The original image showing this was taken by Leo Aerts, on 2015 Oct 31 UT 03:16. Therefore at a selenographic colongitude of 352.0˚ (this is in the lunar morning) the spot is not visible, though Leo's image was of exceptionally high resolution and the selenographic colongitude was 132.0˚. I will tweak the selenographic colongitude setting in Lunar Schedule to make it more appropriate and include similar solar altitudes for both the morning and the evenings - 180˚ apart. I think I will also increase the required aperture, as slightly higher resolution may be needed.

Alphonsus: On 2023 Nov 22 UT 00:31 Ivan Walton, using a remotely operated telescope in Chile, imaged this crater under similar illumination to the following report:

Alphonsus 2004 Feb 29 UT 19:00-19:15 Observed by Brook (Plymouth, England, 60mm OG x120) "Checked central peak of Alphonsus using 60mm OG x120 + right angle prism. Moon at very high elevation, seeing excellent once clouds had dispersed, transparency also excellent. Time of observation 19-00 hrs UT to 19-15 hrs UT. Noticed fluctuation of brightness of A's central peak compared with the peak of Arzachel. Alphonsus' peak generally brighter." BAA Lunar Section report. ALPO/BAA weight=2.

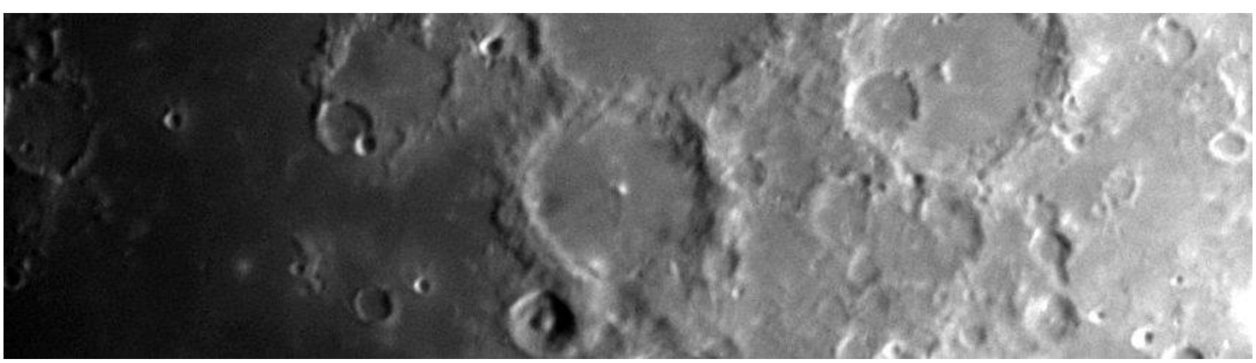


Figure 5. *Alphonsus as imaged by Ivan Walton on 2023 Nov 22 UT 00:31, orientated with north towards the top.*

Although it is not possible to see whether the central peak is fluctuating in brightness from one image, Ivan's image (Fig 5) is useful in that we see that the central peak is almost point like and so, presumably under variable atmospheric seeing conditions, the Gaussian shaped point spread function will blur it more and make the center less bright – distributing the light sideways into the extended seeing disk. Also, it is noted that the 2004 report was made with a small telescope. I will therefore lower the weight to 1.

Deslandres and Lansberg: On 2023 Nov 24 respectively UT 16:36 and 18:00 Valerio Fontani (UAI) imaged these regions under similar illumination to when the Soviet Luna V lander and rocket stages crashed into the Moon and the resulting impact clouds were allegedly imaged through Earth-based telescopes:

ALPO/BAA request - in 1965 May 12 UT 19:10 the Soviet Lunar 5 probe crashed into the Moon (by accident). There are reports of an ejecta cloud, though strangely three locations are given, two of which are based upon telescope observations at the time. We would like you to image the surface of the Moon in the vicinity of these three craters: Copernicus, Deslandres and Lansberg, so that we can compare to photographs which were supposed to show the ejecta cloud back in 1965. Please email any images to: a t c @ a b e r . a c . u k

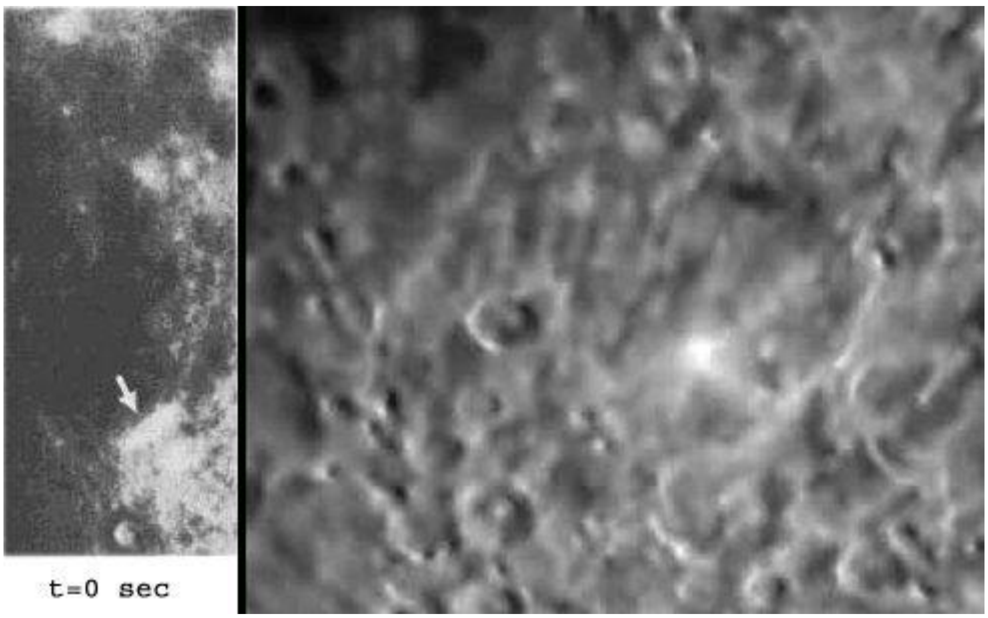


Figure 6. *Deslandres crater and surrounds with north towards the top.* ***(Left)*** *Photograph taken by Penzel on 1965 May 12 from a paper by Geake and Mills: Possible Physical Processes Causing Transient Lunar Phenomena Events, Physics of the Earth and Planetary Interiors, 14 (1977) p299-320.* ***(Right)*** *An image taken by Valerio Fontani (UAI) on 2023 Nov 24 UT 16:36 – this has been blurred and degraded a bit to make it a bit more compatible with the resolution in the Penzel photograph.*

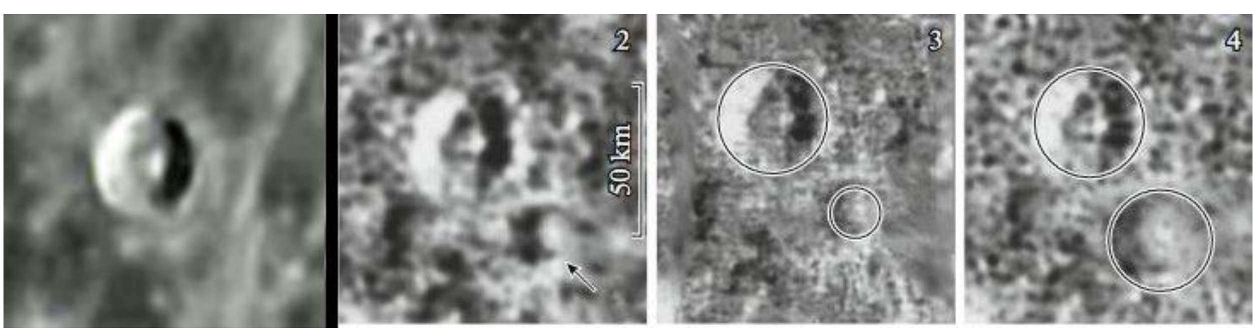


Figure 7. *Lansberg crater orientated with north towards the top.* ***(Far Left)*** *An image taken by on 2023 Nov 24 UT 18:00 by Valerio Fontani (UAI) – image has been degraded in resolution, and contrast stretched to match those in the Ksanfomality paper (See Ref below).* ***(Left)*** *From p280, Fig 4: image 2 from (see Ref below) – arrow points to a possible impact side of the Lun 5 lander.* ***(Right)*** *From p280, Fig 4: image 3 from (see Ref below) – circle indicates possible impact cloud of Luna 5 lander.* ***(Far Right)*** *From p280, Fig 4: image 3 from (see Ref below) – circle indicates possible impact cloud of Luna 5 lander.*

Reference: Ksanfomality, (2018) Luna-5 (1965): Some results of a Failed Mission to the Moon Cosmic Research, Vol 56, No. 4, pp276-282.

The attempt to replicate the Penzel photograph of an expanding cloud from the carrier rocket impact, near Deslandre crater (See Fig 6) was not a great success – something similar happened when we tried this with earlier observations in the Jun/Jul newsletter. The region covered by Valerio (Fig 6 – Right) is smaller, and again I cannot place it in the Penzel image. In the bottom of the Penzel image you can quite clearly see Tycho crater though.

Another one of Valerio's images (Fig 7 – far left) corresponds to the region where the lander was supposed to have impacted, near Lansberg crater (See Fig 7 – Left). Again, the images from 1965 are pretty grainy compared to the modern-day image. What you need to do is to find recognizable bright and dark points in the 1965 images and compare to what you see in Valerio's image. Although the arrowed purported impact cloud looks promising, and it does not appear in the 2023 image, there are lots of other examples of bright and/or dark small-scale features that do not appear either. So, we need to be very careful interpreting the Ksanfomality images. As we have had two attempts at this now, I will adjust the constraint in the Lunar Schedule web pages to include similar viewing angles (topocentric libration) in case this helps interpretation in future.

Aristarchus Area: On 2023 Nov 24 UT 18:58 Les Fry (NAS) imaged this area under similar illumination to the following reports:

Aristarchus, Schroter's Valley, Herodotus 1881 Aug 07 UT 00:00? Observed by Klein (Cologne, Germany, 6" refractor, 5" reflector) "Whole region between these features appeared in strong violet light as if covered by a fog spreading further on 7th. Examined others around & none showed effect. Intensity not altered if Aris. placed out of view." NASA catalog weight=4. NASA catalog ID #224.

1954 Aug 11 Herodotus. Observed by Haas (Las Cruces, NM, USA) "Temporary grayness seen in interior shadow." ALPO/BAA weight=3

On 1955 Oct 28 at UT00:00? Kozyrev (Crimea, Soviet Union, 50" reflector) detected in Aristarchus Fraunhofer lines in UV spectra that were much narrower than in the solar spectrum. This indicated luminescent glow which overlapped contour(?) lines. Greatest after Full Moon, but fluctuated monthly with no indication of solar activity effect. The Cameron 1978 catalog ID=621 and the weight=5. The ALPO/BAA weight=5.

Aristarchus 1976 Sep 05/06 UT 18:45-01:35 Observed by Prout (England?, 12" reflector, S=III-II), Foley (England, 12" reflector), Moore and Spry (Sussex, England, 12" reflector) "Viol. hue on crater on W. wall, especially NW corner seen by Prout & 2 Foleys. Moore & Spry did not see color. All obs. noted that the crater was dull <Tycho pr Proc. At 2140h all noted it was brighter & now brightest on Moon. Color disappeared at 2143h (30-40% incr in bright.)" NASA catalog weight=1 for Prout and 5 or all other observers. NASA catalog ID #1449.

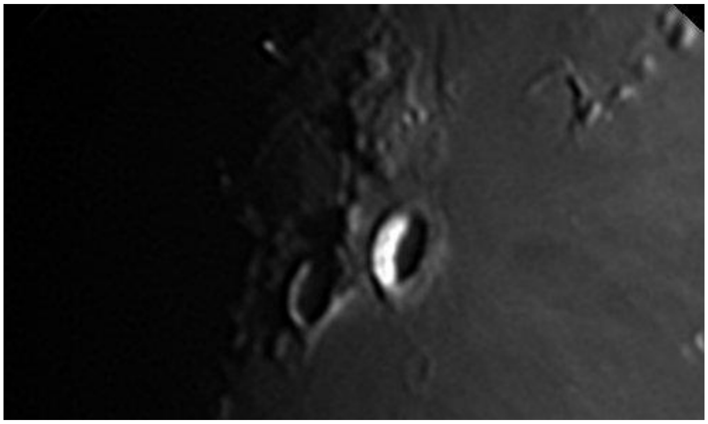


Figure 8. *Aristarchus on 2023 Nov 24 UT 18:58 as imaged by Les Fry (NAS) and orientated with north towards the top.*

Although not a color image, Figure 8 is a useful context image for the 1881, 1954, 1955 and 1976 LTP reports. I did check a contrast stretched version of the image to see if there was a temporary grayness in the shadow of Herodotus, as was reported back in 1954, but the image resolution and contrast is not sufficient to help with the interpretation. We shall leave the weights of these respective reports as they are for now.

Aristarchus Area: On 2023 Nov 24 UT 21:21 Chris Longthorn (BAA) imaged the area around Aristarchus under similar illumination to the following report:

Aristarchus Area 2004 Nov 22 UT 04:58-05:49 Observed by Gray (Winemucca, NV, USA, 152mm f/9 refractor, seeing 4-5, transparency 4-5, x114, x228) "Blinked Herodotus with Wratten filters Blue 38A and Red 25. The illuminated west crater wall stood out brilliantly in blue light, much more so than in white light. This was true also of Aristarchus. Red light did not increase contrasts in Herodotus any more than they were in white light. Shadows in Herodotus appeared as black as the night west of the terminator and remained that way throughout the observing period. No LTP seen in Herodotus tonight. A possible LTP was seen to the west of Herodotus near the terminus of Schröter's Valley. It was noted at the beginning of the observing period that there were four very bright spots of light, one near the end of Schröter's Valley, the other three grouped together a little farther north. Although not far from the terminator they were definitely east of it. It was noted that all of them nearly vanished in the Blue 38A filter while Aristarchus and the rim of Herodotus gleamed brilliantly. At 5:19UT it was noted that the most brilliant of the four lights, the one near the terminus of Schröter's Valley, had faded almost to invisibility in white light. When first seen it had been brighter than Aristarchus. It remained very dim after this through the remainder of the observing period, and was unchanged at 7:35-7:49UT when I again examined the area. The other three bright spots remained brilliant and unchanged.". ALPO/BAA weight=3.

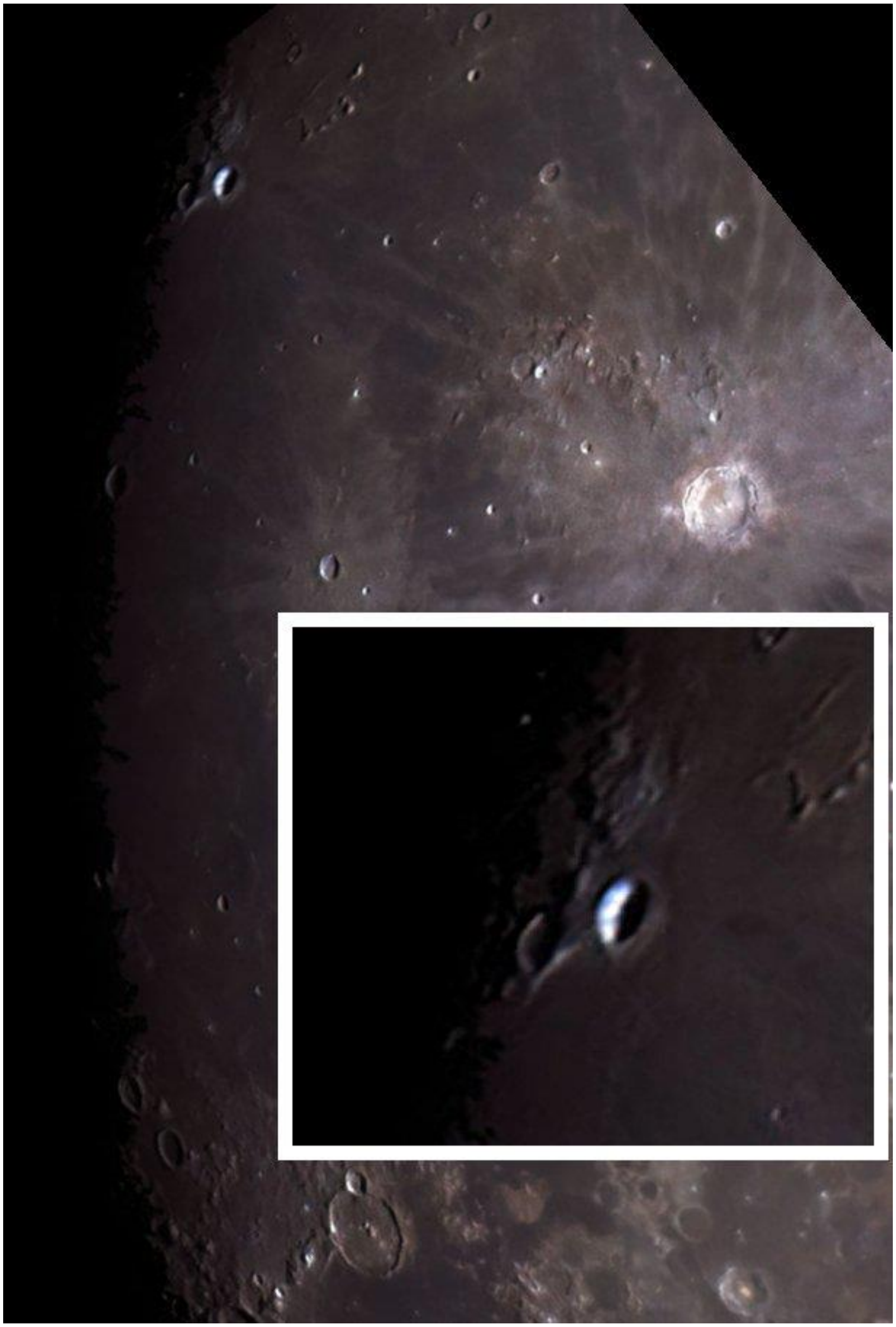


Figure 9. *Aristarchus on 2023 Nov 24 UT 21:21 as imaged by Chris Longthorn (BAA) and orientated with north towards the top. Insert shows an enlargement of the Aristarchus region.*

Fig 9 certainly shows that Aristarchus is very bright, so this is probably normal for what was seen in 2004. Also the crater west rim is its normal blue color, though the west rim of Herodotus does not exhibit blueness. Only one bright spot can be seen in the Vicinity of Vallis Schröteri and this is clearly a mountain, or hill, poking out through the terminator shadow into sunlight. Any others present maybe off the edge of the image frame. We shall leave the weight at 3 for now, since although Aristarchus is normally bright and has a bluish cast, the same cannot be said for Herodotus, and we can't say much about the four bright spots.

Plato: On 2023 Nov 26 UT 09:52-09:55 Maurice Collins (ALPO/BAA/RASNZ) imaged the whole lunar disk, but this included Plato under similar illumination and viewing angle to the following report:

Plato 1874 Jan 01 UT 20:00? Observed by Pratt (England?) "Unusual appearance" NASA catalog weight=1. NASA catalog ID #183. ALPO/BAA weight=1.

Figure 10. *Plato on 2023 Nov 26 UT 09:52-09:55 as imaged by Maurice Collins (ALPO/BAA/RASNZ) and orientated with north towards the top.*

Fig 10 certainly does not show anything unusual about the crater, so if there was anything odd in 1874, I am guessing that it had something to do with the craterlets on the floor of Plato as they were a popular topic back in those days. We shall leave the weight at 1 for now.

Aristarchus Area: On 2023 Nov 28 UT 23:19 Bill Leatherbarrow (BAA) imaged this region in color under similar illumination (and for the 1970 report, similar viewing angle too) for the following two reports:

1969 Jan 04 UT19:30-20:00 W.Deane (Hendon, UK, 2" refractor) observed a bright yellow spot just E of Aristarchus, stretching from the S. end of Montes Harbinger to the S. wall of Prinz. The ALPO/BAA weight=1. ALPO/BAA weight=1.

On 1970 Nov 14 UT20:10 J.Coates (Burnley Astronomical Society, 8.5" reflector, x102 and x204) saw a dirty green color on the NW region of the crater, in patches, with a green area nearby. ALPO/BAA weight=1.

Figure 11. *Aristarchus on 2023 Nov 28 UT 23:19 as imaged by Bill Leatherbarrow (BAA) and orientated with north towards the top.*

Bill's image illustrates the natural surface colors present in and around this region. For the 1969 report, although Fig 11 does not include Montes Harbinger, it does include sufficient terrain just to the east of the partly buried Prinz crater, such that that if a natural yellow cast to the surface was present here it should show up. It does not however, therefore what was seen by Deane, remains unexplained, though the aperture of the scope, 2", was rather small – so the weight of 1 seems appropriate. For the Coates report from 1970, there is simply no dirty green on the NW of the crater rim in Bill's image, and as the scope used in 1970 was a respectable 8" reflector, the color is difficult to explain. We shall therefore leave the weight at 1 for now.

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. 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

Basin and Buried Crater Project

Coordinator Dr. Anthony Cook- atc@aber.ac.uk

Unfortunately, no images or sketches have been sent in specifically for the BBC project recently, nor any armchair work done at the computer, so I thought that I would pick another candidate buried crater from the catalog, and look at evidence for there being a crater there, or not? So this month's buried crater is: PFC 14, which is provisionally located at 83.0˚W 46.4˚N with a diameter of 63 km.

Just to remind the reader, PFC stands for "Partly Filled Crater". The PFC's listed come from the paper by: A.J. Evans, J. M. Soderblom, J. C. Andrews-Hanna, S. C. Solomon, and M. T. Zuber (2016), Identification of buried lunar impact craters from GRAIL data and implications for the nearside maria, Geophys. Res. Lett., 43, 2445–2455, doi:10.1002/2015GL067394.

So, let's look at the NASA Quick Map web site and see what is there at this location. This clearly shows quite clearly a complete, albeit degraded, crater here with an existing name of "Gerard Q" (See Fig 1) and so it is not correct to suggest that this was completely unknown. Using measurements taken using NASA Quickmap web site, the diameter of this crater is 66.3 km, i.e. 3.3 km bigger than the catalog entry, and located at 83.2˚W 46.6˚N. The crater may have a central ring of hills, as some larger craters do, though the hummocky terrain on the W/N/NW interior makes interpretation difficult.

Figure1 *LROC Quickmap WAC nearside mosaic (WAC+NAC+NAC_ROI) centered on the approximate location of PFC 14.*

The lava filling of the eastern floor shows up well in the Iron Oxide (FeO) plot in Fig 2. There are a lot less mare areas on the lunar far side due to the thicker crust, but PFC14 is in a half way house situation, being very close to the far side.

Figure 2 *LROC Quickmap FeO abundance map, based upon Clementine UVVIS waveband imagery - centered on the approximate location of PFC 14.*

As always, azimuth direction plots of the slope on the surface can be quite revealing. Fig 3 shows the rim of PFC 14 a lot clearer than in Fig 1, and its pentagonal in shape. N-S and NW-SE trending rilles are visible externally from the crater and there is a curved rille to the NW. PFC14 appears to have formed over the top of another crater, to the NW, some 44 km in diameter and centered on 84.1W, 47.4N, which I will add to the list of buried craters

As we have identified PFC14 as Gerard Q, and it's an IAU named crater, we can remove it from the Buried Crater list, and should not have appeared in the Evans et al. paper in the first place. We can however add the new 44 km diameter, half buried, crater to the list instead.

Figure 3 *LROC Quickmap SLDEM2015 Azimuth plot.*

If you think that you have discovered a new impact basin, or unknown buried crater, please check whether it has been found previously on the following web site, and if not email me its location and diameter so that I can update the list.

https://users.aber.ac.uk/atc/basin_and_buried_crater_project.htm.

Alternatively, if you want an observational challenge, try to see if you can image one of more of the basins or buried craters at sunrise/set and establish what colongitude range they are best depicted at. Or you can even do this "virtually" with LTVT software. As you can see from the tables on the web sites there are lot of blank cells to fill in on the sunrise and sunset colongitude columns – so a good opportunity for you to get busy!

Lunar Calendar January 2024

Date	UT	Event
1	1500	Moon at apogee 404,909 km
4	0330	Last Quarter Moon
4	1850	Moon at descending node
5	0000	Spica 2.0° south of Moon
8	1500	Antares 0.8° south of Moon, occultation North and South America
8	2000	Venus 6° north of Moon
8		West limb most exposed -6.8°
10	0900	Mars 4° north of Moon
10		Greatest southern declination -28.1°
11	1157	New Moon, lunation 1250
11		North limb most exposed +6.5°
13	1100	Moon at perigee 363,267 km
14	1000	Saturn 2.0° north of Moon
15	2000	Neptune 0.9° north of Moon, occultation Antarctica region
17	1405	Moon at ascending node
18	0353	First Quarter Moon
18	2100	Jupiter 3° south of Moon
19	2000	Uranus 3° south of Moon
20	1400	Moon 0.8° south of Pleiades
20		East limb most exposed +5.9°
23		Greatest northern declination +28.2°
24	2000	Pollux 1.7° north of Moon
24		South limb most exposed -6.5°
25	1754	Full Moon
29	0800	Moon at apogee 405,777 km
31	2017	Moon at descending node

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

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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
Alberto Anunziato–albertoanunziato@yahoo.com.ar
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: Lacus Mortis

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 March 2024, will be Lacus Mortis. 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):

Alberto Anunziato – albertoanziato@yahoo.com-ar
David Teske – david.teske@alpo-astronomy.org

<u>Deadline for inclusion in the Lacus Mortis Focus-On article is February 20, 2024</u>

FUTURE FOCUS ON ARTICLES:

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

Subject	TLO Issue	Deadline
Lacus Mortis	**March 2024**	**February 20, 2024**
Chains of Craters	**May 2024**	**April 20, 2024**
Mare Nectaris	**July 2024**	**June 20, 2024**
Aristoteles and Eudoxus	**September 2024**	**August 20, 2024**
Archimedes Region	**November 2024**	**October 20, 2024**

Focus-On Announcement

Lacus Mortis: One of the Strangest-Looking Parts of the Moon

The definition belongs to the remembered Peter Grego and they are words that justify us taking a tour of this selenographic feature, difficult to define: a plain? Rather, an enormous and very old crater, of which little remains, in the center of which is a very prominent crater, Bürg, and which has been almost completely covered by lava, which adds to the charm of this very ancient crater-plain the attractions of rilles, wrinkle ridges and even the skylight of a lava tube. We are going to add images to analyze this very particular area, located at the eastern end of Mare Frigoris.

JANUARY 2024 ISSUE-Due December 20, 2023: SINUS IRIDUM

MARCH 2024 ISSUE: Due February 20, 2024: LACUS MORTIS

FOCUS ON MAY 2024: Due April 20, 2024: CHAIN OF CRATERS

FOCUS ON JULY 2024: Due June 20, 2024: MARE NECTARIS

FOCUS ON SEPTEMBER 2024: Due August 20, 2024: ARISTOTELES AND EUDOXUS

FOCUS ON NOVEMBER 2024: Due: October 20, 2024: ARCHIMEDES, AUTOLYCUS AND ARISTILLUS

David Teske

Focus-On Announcement
Chains of Craters: The More the Better

Today we know the origin of the groupings of craters very close to each other, but it took years of progress in our knowledge of the Moon to know if the craters that appear very close to each other have a common origin and what that origin is. We are going to learn about the chains of craters (or Catenae, according to the International Astronomical Union) that appear on the Moon, whether they were produced by the fragmentation of an impactor, by secondary impacts of a main crater or by collapses of volcanic origin. Let's share images of chains of craters from the smallest to the super massive ones like Vallis Rheita.

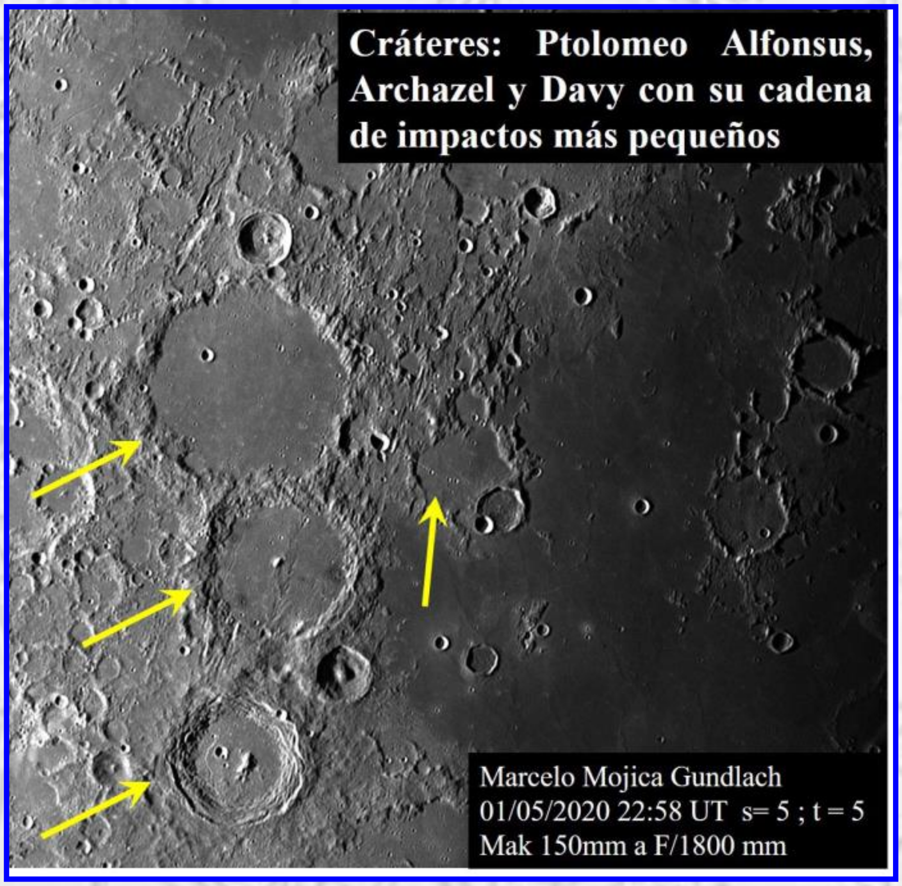
MARCH 2024 ISSUE: Due February 20, 2024: LACUS MORTIS

FOCUS ON MAY 2024: Due April 20, 2024: CHAIN OF CRATERS

FOCUS ON JULY 2024: Due June 20, 2024: MARE NECTARIS

FOCUS ON SEPTEMBER 2024: Due August 20, 2024: ARISTOTELES AND EUDOXUS

FOCUS ON NOVEMBER 2024: Due: October 20, 2024: ARCHIMEDES, AUTOLYCUS AND ARISTILLUS



Marcelo Mojica Gundlach

Key to Lunar Images In This Issue

Gregory Shanos

1. Apianus
2. Archimedes
3. Aristarchus
4. Aristoteles
5. Atlas
6. Clavius
7. Cleomedes
8. Copernicus
9. de la Rue
10. Endymion
11. Fracastorius
12. Humorum, Mare
13. Hyginus
14. Iridum, Sinus
15. Janssen
16. Kepler
17. Laplace
18. Licetus
19. Manilius
20. Messier
21. Plato
22. Procellarum, Oceanus
23. Ramsden
24. Theophilus
25. Yangel’