THE LUNAR OBSERVER

A PUBLICATION OF THE LUNAR SECTION OF THE A.L.P.O.
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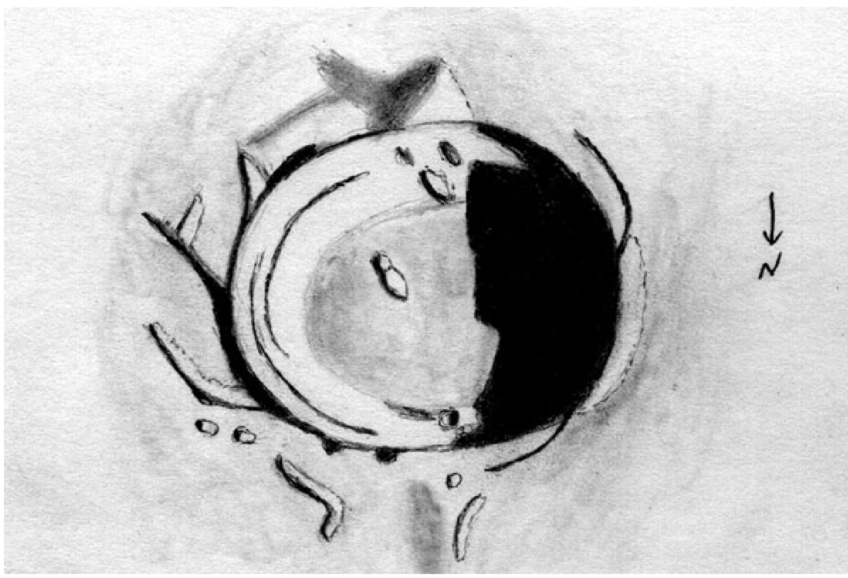
FEATURE OF THE MONTH - MARCH 2005



WERNER
Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA
October 5, 2004 - 6:16 to 6:38 UT
15cm Newtonian - 136x - Seeing 6-7/10

I sketched this crater on the morning of October 5, 2004 while observing five occultations. This is a large, fairly crisp crater in the south-central part of the moon. There is a double central peak and terraced inside walls. There was considerable interior shadow, but little evidence of a raised rim. There is a small pit on the inside north wall that is Werner D. according to the Lunar Quadrant Map. (On Oct. 3 Werner D appeared as a tiny, bright, shadowless dot.)

There were a couple of short, detached ridges north of Werner, and one or two others attached to its east rim. There were two narrow strips of shadow that appeared like cracks along the west rim. A large, low, triangular elevation was seen on the south rim. I have drawn nearby peaks and shadows as I saw them that morning.

EDITOR: Werner can be found on Map 55 of Rukl's Atlas of the Moon.

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

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

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

Our quarterly journal, **The Strolling Astronomer**, contains the results of the many observing programs which we sponsor including the drawings and images produced by individual amateurs. Several copies of recent journals can be found on-line at: **http://www.justfurfun.org/djalpo/** Look for the issues marked FREE, they are not password protected. Additional information about the A.L.P.O. can be found at our website: **http://www.lpl.arizona.edu/alpo/** Spend a few minutes browsing the Section Pages to learn more about the fine work being done by your fellow amateur astronomers.

To learn more about membership in the A.L.P.O. go to: **http://www.lpl.arizona.edu/~rhill/alpo/member.html** which now also provides links so that you can enroll and pay your membership dues online.

LUNAR TOPOGRAPHICAL STUDIES

Acting Coordinator - William M. Dembowski, FRAS
dembowski@zone-vx.com

OBSERVATIONS RECEIVED

MICHAEL AMATO - WEST HAVEN, CONNECTICUT, USA
Ray maps of Messier (1), Menelaus (1), Proclus (2), Kepler (2), Aristarchus (1)

MICHAEL BOSCHAT - HALIFAX, NOVA SCOTIA, CANADA
Digital image of 11-day moon near Gassendi

ED CRANDALL - WINSTON-SALEM, NORTH CAROLINA, USA
Digital image of Tycho Rays

HOWARD ESKILDSEN - OCALA, FLORIDA, USA
Digital image of 26-day moon, 29-day moon, Anaxagoras, 1-day moon, Southern region, Mare Orientale (2)

KIM HAY - ONTARIO, CANADA
Digital image of 21-day moon

ROBERT H. HAYS, JR. - WORTH, ILLINOIS, USA
Sketches of Werner, Prinz, Proclus
Timings of the occultations of 59 stars by the Moon

RAFAEL BENAVIDES PALENCIA - POSADAS, CORDOBA, SPAIN
Digital images of Copernicus, Hippalus, Mons Vinogradov, Valis Alpes, Wurzelbauer, Plato, Montes Carpatus

K. C. PAU - HONG KONG, CHINA
Digital images of Aristarchus & Schroter's Valley, Marius Hills and Domes, Copernicus Rays (2), Plinius, Carrel, Fracastorius, Madler, Mare Crisium

ROBERT WLODARCZYK - CZESTOCHOWA, POLAND
Sketches of Sabine & Ritter & environs, Aristillus & Autolycus

Observations submitted should include the following:

Name and location of observer
Name of feature
Date and time (UT) of observation
Size and type of telescope used
Magnification (for sketches)
Medium employed (for photos and electronic images

MILICHIUS π : Observations, measurements and classification.

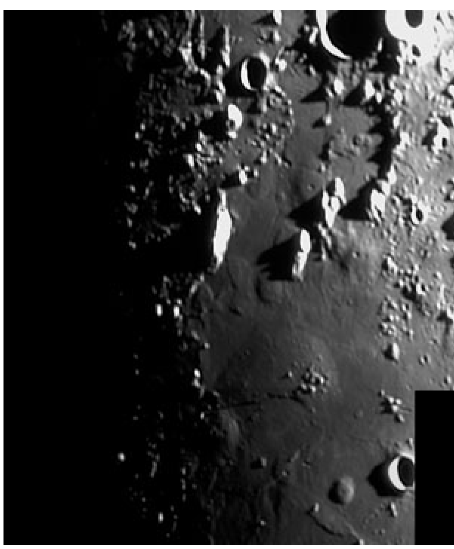
By Raffaello Lena, Rodrigo Viegas, Jim Phillips
and Maria Teresa Bregante - GLR group

In a previous paper [1], some of us described the highland dome located near the crater T. Mayer-B. Moreover, we reported some images of the very well known Milichius region. A study about two lunar cones located near the crater Milichius [1] will be published in a next issue of Selenology, the Journal of the American Lunar Society (ALS).

The dome field near crater Milichius has been thoroughly studied. The A.L.P.O. Lunar Dome list reports several low domes in this region. Another comprehensive study of lunar domes was written in 1964 by Brungart [2]. The author compiled a catalogue of 261 domes where he reported their coordinates, diameters, heights, slopes and morphological characteristics [3]. Here, under the entry #190, Brungart reported for Milichius π (Xi = - 0.510 Eta = + 0.175) a height of 742 m with an average slope of 9 º. In clear agreement with Brungart, the height of Milichius π (Xi = -0.510 Eta = +0.175) was computed as 720 meters in [4], where a drawing by Donald Watts was used.

Domes are one of the most difficult types of lunar objects to study quantitatively. Domes are such low and gently sloped features that it is very difficult to measure accurately their shadow lengths to derive topographic information. Recently, some of us described in [5] the dependence of an ideal hemispherical dome shadow length (R) on solar elevation and its diameter-height (D/H) ratio. A recent LPOD item by Wood [6] focused on our study concerning artificial domes.

For Milichius π we found [5] the best fit for D/H = 40, yielding an average dome slope of 2.9° and a height of about 200 m.



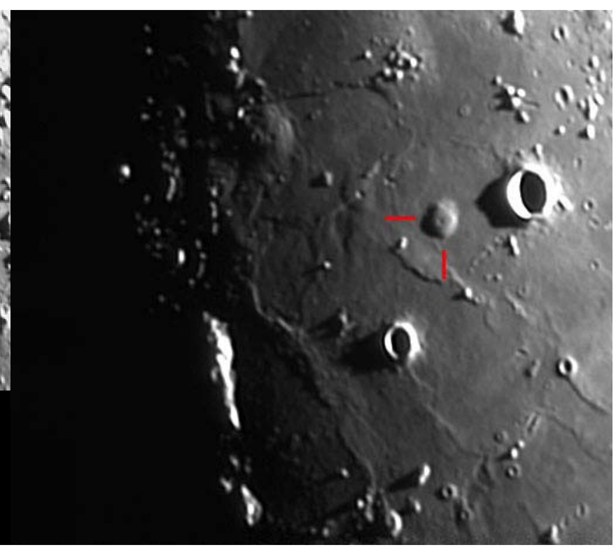


Figure 1 **Figure 2**

Digital images by Jim Phillips - See text for details

On the best image (Fig.1), the dome diameter and the length of its shadow were both measured in pixels. The corresponding scale of the image was obtained (0.296 km per pixel), allowing diameters and shadow lengths to be expressed in kilometres. The image by Phillips, here proposed as Fig.1 and 2, was also compared with a high-resolution version of the Lunar Orbiter frame IV-133-H2. The solar altitude

(Alt) as seen from Milichius π (located at 31.20° W and 10.08° N) and the colongitude (C) were calculated using the Lunar Observer's Tool Kit software by Harry Jamieson. According to Ashbrook [7], the average slope of the dome flank is equal to the solar altitude when x = 0.25, where x is the fraction of the dome diameter that is covered by black shadow. The height (H) of the dome was then calculated by the formula (1):

$$H = r (\tan s)$$

where r is the radius of the dome and (tan s) is the tangent of the average slope angle when the dome is ¼ covered by black shadow (x = 0.25). Our results are reported in Table 1.

Table 1: measurements on the image taken by Jim Phillips on December 22nd 2004 at 02:37 UT using a TMB 8" F/9 Apochromatic refractor. Scale of the image is 0.296 km per pixel. The coordinates of Milichius π are 31.20° W and 10.08° N (Xi = -0.510 Eta = +0.175).

Colongitude (C)	Solar Altitude (Altº)	Dome diameter		Shadow length		Height (meters)	Maximum slope (º)
		pixels	Km	pixels	Km		
34.20	2.72	30±1	8.9±0.30	7±1	2.07±0.30	211.4	2.72

This dome requires a specific solar altitude for it to be observed clearly. Moreover, we were able to distinguish between the black shadow and the dark grey shading of the dome flank which represents grazing illumination by sunlight. From Table 1 and [7] it follows that the maximum slope angle of the dome is 2.72°. The height of the dome was then estimated using the formula (1). It turns out that the summit of the dome is 211 metres higher than the surrounding plain. This estimated height is comparable with the preceding value determined (200 m) using an artificial model, as described in [5].

These measurements provide some insight into the possible explanation for the difference with the heights reported in [3-4]. Likely, the variation is due to an incorrect evaluation of the black shadow on the dome flank.
The results obtained suggest strongly that previous estimation of Milichius π height were wrong.

Future observing schedules of the GLR group are being planned to investigate different lunar domes on a case by case basis. It is hoped that by eliminating many of the less reliable reports in the A.L.P.O. catalogue, we will be left with a core set of observations upon which more reliable statistical analysis can be performed. The activity of the GLR group is at www.glrgroup.org .

References:

[1] R. Viegas, R. Lena and J. Phillips, TLO, February 2005, pp.4-5
[2] C.Wood, Brungart Catalog of lunar domes http://cwm.lpod.org/DataStuff/Brungart-Domes/BrungartDomes.html
[3] D.L. Brungart, Airforce Institute of Technology Wright Patterson Air force Base, Ohio, 15 July 1964.
[4] H. Jamieson, JALPO, vol 37, 1 (1993).
[5] R. Lena, C. Fattinnanzi, F. Lottero, Lunar Domes and Artificial Domes: Two Tools for Lunar Observers, Selenology, vol 23 –2, 2004.
[6] C. Wood, LPOD- http://www.lpod.org/LPOD-2004-10-25.htm
[7] J. Ashbrook, JALPO, vol 15, 1-2 (1961)

TWO VIEWS OF ORIENTALE

By UAI Lunar Section - Raffaello Braga (rafbraga@tin.it)
Paolo Lazzarotti (paololazzarotti@astromeccanica.it)
and Gerardo Sbarufatti (elyx69@libero.it)

As every lunar observer knows librations allow us to see more than merely one hemisphere of the Moon. Among the many interesting features that lie in the so-called "librations zones", Mare Orientale (19.4° S, 92.8° W) is surely the most intriguing. Under favourable librations and illumination conditions it is even possible to give a look to the innermost lava plains within the ring of the Montes Rook. Imagers Paolo Lazzarotti and Gerardo Sbarufatti of the UAI Lunar Section produced these two beautiful views of the Orientale basin (Figures 1 & 2) made respectively on the first and the last day of January 2005, both in the early morning when the Moon had almost the same phase:

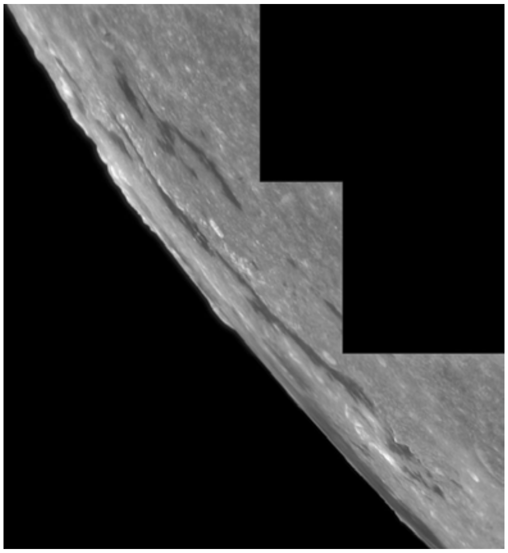


Figure 1

Paolo Lazzarotti
January 1st, 2005 at 02:25 UT
Longitude Libration: -5.75°
Latitude Libration: -4.93°

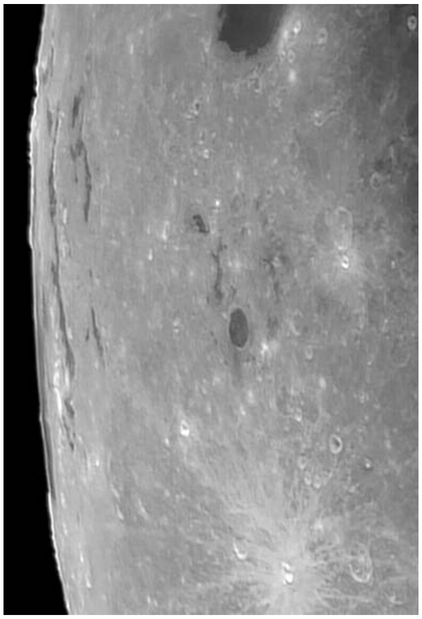


Figure 2

Gerardo Sbarufatti
January 31st, 2005 at 02:43 UT
Longitude Libration: -6.87°
Latitude Libration: -1.27°

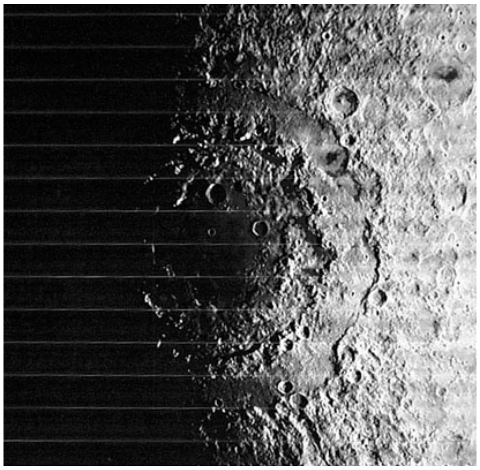


Figure 3

Lunar Orbiter IV Photograph courtesy of NASA

Although the lunar relief is best seen with the Sun low on the local lunar horizon, a high illumination enhances the contrast between the dark patches of lava that erupted on the mare plains and the surrounding light grey landscape, making the plains easier to be recognized. Lacus Autumni, that lies between the Montes Cordillera and the Montes Rook (Figure 3, the LO IV photograph) can be seen even at modest libration angles and its curious shape – as seen by effect of foreshortening, resemble a scorpion with the chelas directed toward W and the tail bent toward S. Crater Schlüter can be recognized close to the northern "chela". Further inside the basin, beyond the Montes Rook whose shining summits are clearly visible in both images, the longest dark and irregular strip that is visible is the Lacus Veris, which is interrupted to the north by a short relief connecting the Rooks with the innermost mountainous ring. The central plain of Mare Orientale can be seen just on the limb, a long, grey streak partly bordered by the Rooks, whose indented profile is visible almost all round the plain but particularly on the NW and SW sides (see Figure 1).

A look to the libration zone charts on the Atlas of the Moon by Antonin Rükl (for Mare Orientale see charts 50 and VII) reveals that many other interesting lunar features can be seen from Earth in those neglected territories.

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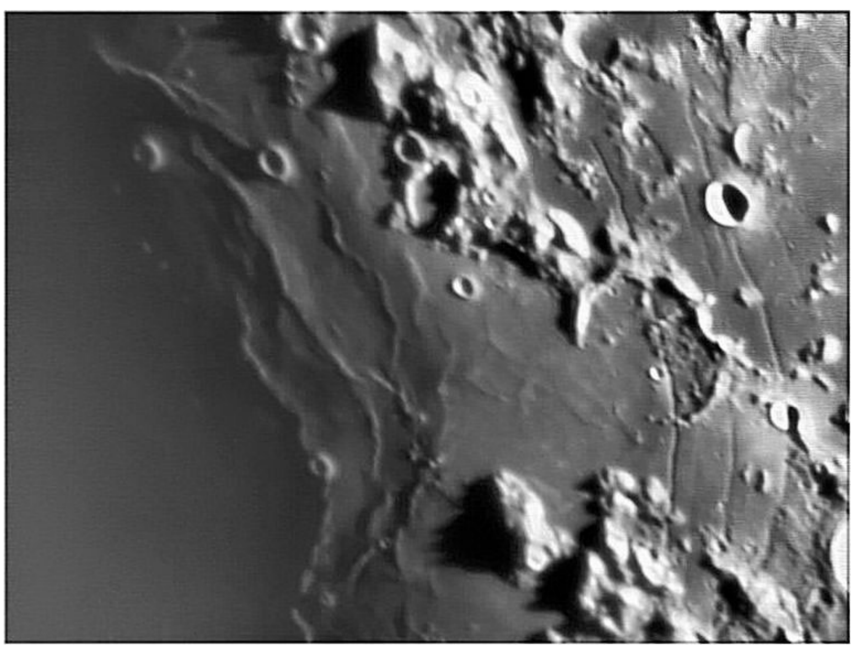
RECENT TOPOGRAPHICAL OBSERVATIONS

21-DAY MOON
Digital Image by Kim Hay - Ontario, Canada
January 31, 2005 - 09:50 UT
8 in. f/4.5 Newtonian (Dob) - Fuji Finepix S3000



RILLES & WRINKLE RIDGES NEAR HIPPALUS
Digital image by Rafael Benavides Palencia - Posadas, Cordoba, Spain
January 20, 2005 - 21:23 UT
235mm Schmidt-Cass. - 2x Barlow - Philips Toucam Pro-1

RECENT TOPOGRAPHICAL OBSERVATIONS

11-DAY MOON AT MARE HUMORUM
Digital image by Michael Boschat - Halifax, Nova Scotia, Canada
February 19, 2005 - 23:45 UT
12cm f/8.2 Refractor - 15mm EP - Centrios Camera

1-DAY MOON
Digital image by Howard Eskildsen - Ocala, Florida, USA
February 9, 2005 - 23:29 UT
6 inch f/8 Refractor - Orion V-block Filter - Nikon Coolpix 4300

BRIGHT LUNAR RAYS PROJECT

Coordinator - Willliam M. Dembowski, FRAS

Each month TLO features a book or magazine excerpt dealing with Bright Lunar Rays.
Some are from current sources, others from vintage astronomical literature.
This month's offering is from:

OBSERVING THE MOON: Patrick Moore's Practical Astronomy Series
By Peter Wlasuk - Springer-Verlag - 2000 (Various Pages)

Some of the freshest impact sites of the Moon are *ray craters*. If you look hard enough, you will notice some evidence of debris ejected by the impact around most lunar craters. This debris may take the form of a milky white *ejecta blanket* dusting the outer slopes of the crater walls, or perhaps less organized piles of rubble inside or outside the walls. The ejecta blanket often takes on a hummocky appearance and can spread out for up to one crate diameter. A few craters radiate several *rays of ejecta* material. Lunar rays show no shadows, so we know they have no appreciable height or thickness. They are just splashes of finely pulverized lunar rock (some- times called *rock flour*) sprayed across the surface of the Moon for up to hundreds of kilometers. Often rays spread out in all directions from their parent crater, forming patterns that have been likened to a peeled orange or a fractured Christmas ornament. In general, rays are best seen around full moon; rays associated with a particular formation may be seen when the Sun is overhead at that formation. Use binoculars rather than a telescope to observe them, for these ray systems extend across large amounts of ground.

Lunar rays formed when pulverized particles of rock flew away from the impact that created the associated crater. Much of this material was accelerated to speeds of up to 40 km s^{-1} (25 miles s^{-1}), much greater than the Moon's escape velocity; some slower-moving debris falls back to the lunar surface to create the typical ray pattern. Craters like Tycho and Kepler have very bright, extensive ray systems. Probably many more craters showed rays at one time, but most of them have faded away over time due to the discoloring effect of ions that make up the solar wind and as a result of the gardening action of micrometeorites, which tends to mix up the whitish ray material with the darker underlying lunar soil. Ray systems are further evidence for the impact origin of lunar craters - during World War II, scientists discovered that bombs produced craters with ray systems just like those found on the Moon. There are many unsolved mysteries surrounding the lunar rays which planetary geologists are trying hard to solve. For example, why is it that some fairly inconspicuous craters have huge ray systems, while the rays of much more impressive craters are much less spectacular? Why do their shapes vary so much from one ray system to the next?

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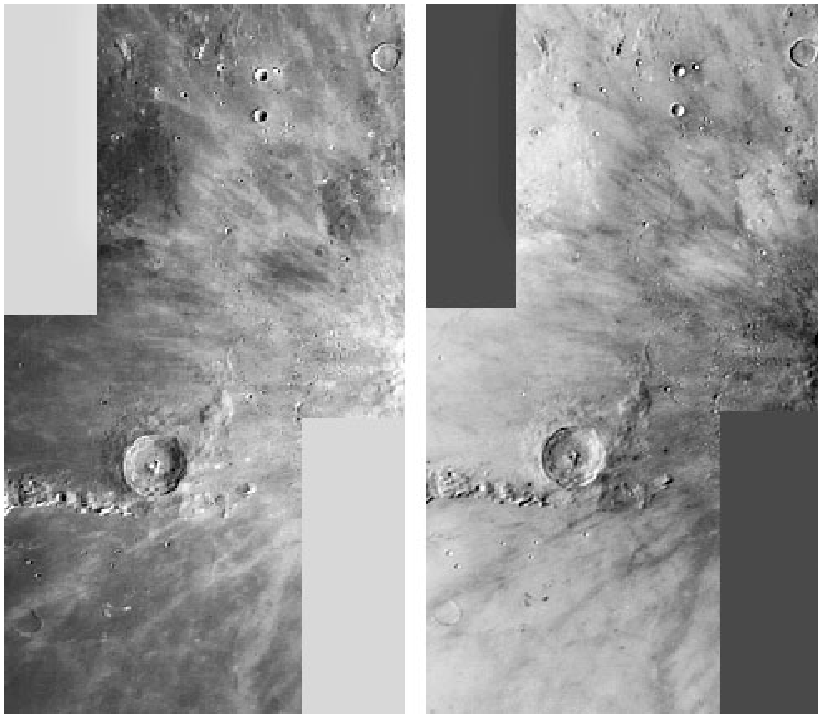
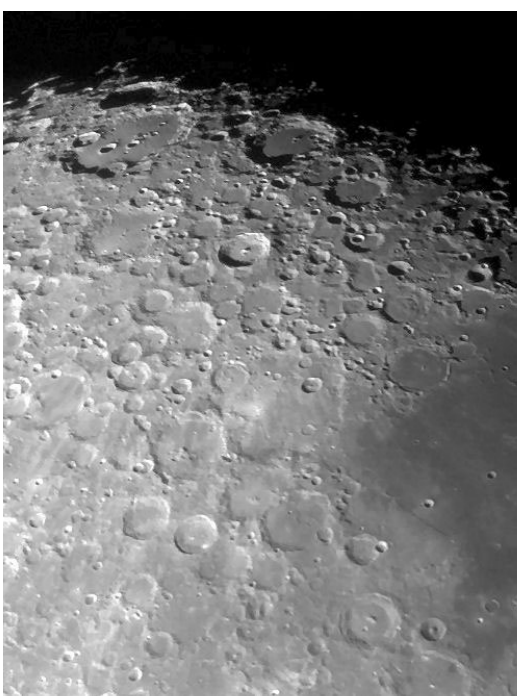
The third component of the ejecta is the magnificent ray system of Copernicus, best seen at full moon, and second only to the rays of Tycho. Goodacre was of the opinion that "any attempt at mapping them would be futile." Still, it's fun to try! These rays, which are superimposed on the older terrain lying beneath them, extend for hundreds of kilometers and are clear evidence that Copernicus is a relatively "fresh" lunar crater.

RECENT RAY OBSERVATIONS



COPERNICUS RAY SYSTEM
AS POSITIVE AND NEGATIVE
Digital image by K.C. Pau - Hong Kong, China
October 4, 2004 - 21:29 UT
250mm f/6 Newtonian - 2.5x Barlow - Philips Toucam



RAY SYSTEM OF TYCHO
NEAR TERMINATOR

Digital image by Ed Crandall
Winston-Salem, North Carolina, USA
November 3, 2004 - 02:20 UT
10 inch f/7 Newtonian - Philips Toucam

LUNAR SWIRLS, MAGNETIC ANOMALIES, AND THE REINER GAMMA FORMATION

By Marvin W. Huddleston, FRAS
Acting Coordinator, Lunar Dome Survey

This article originally appeared in the Proceedings of the Annual Meeting of the Association of Lunar & Planetary Observers, 1994 and currently resides on Marvin's Volcanic Lunar Domes Website at http://www.geocities.com/kc5lei/lunar_dome.html

ABSTRACT

Reiner Gamma is the only near side example of the elusive Lunar Swirl features. There exist only three other known examples, two on the moons far side, and another on Mercury. The origin of these surface deposits and their related magnetic anomalies are a matter of debate, which most likely will not be settled until future lunar missions. We shall here consider their nature and possible origins.

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Over a period of 20 or so years, this writer has enjoyed observing many different forms of Lunar features. But one of the most intriguing questions about lunar features I have encountered has been the nature of the lunar ray systems. This interest led me to the feature known as Reiner Gamma, centered at the selenographic coordinates Xi= -.851 Eta= +.129, or -59.11 Deg. Longitude, +7.41 Deg. Latitude. At first glance, one gets the distinct impression that this object is nothing more than a curious Ray feature, but upon more detailed investigation, obviously this is not so.

One strange aspect I find concerning this object is its neglect in most of the popular lunar literature. Only when one begins to actively investigate such an object does this become obvious, as happens with Reiner Gamma. It is all but ignored in the popular lunar works, with only recent exceptions. It has been drawn on many lunar charts, photographed by the Lunar Orbiter and Apollo missions, and many earth based telescopes. Descriptions of objects in its vicinity abound, but it is seldom mentioned outside professional texts. Even such prolific lunar students as Patrick Moore have paid little attention to this feature.

One prominent aspect of this deposit differentiates it from the lunar ray systems. Unlike the major ray features associated with major impact craters such as Tycho, Copernicus, and Kepler, for instance, Reiner Gamma becomes easily visible soon after lunar sunrise and shortly before lunar sunset.

Apparently, Reiner Gamma is a ray-type surficial deposit, possibly composed of substrate material such as powdered rock. Its appearance is that of a swirl-like pattern composed of high and low albedo units. It is the only nearside example of the rare lunar "swirls." Two additional examples of these features are found on the far side, near Mare Marginis and Mare Ingenii. Based on the most accepted theories of swirl genesis, we might conclude that the only probable correlation between swirl features and the lunar rays to be in the composition of the high albedo units.

This writer's early hypothesis identified Reiner Gamma with the ray extending from Kepler to approximently XI = -.810 ETA = +.130. On any good lunar photograph of the Reiner Gamma/Kepler region, one will note an uncanny alignment between the Swirl deposit and this western Kepler ray.

Others have proposed similar ray-crater candidates, such as the ejecta blanket and diffuse ray system of Cavalerious, also the bright rayed crater Olbers A (8). It must be noted that Reiner Gamma exhibits a higher albedo than the Cavalerious rays, while in contrast the albedo units of both Reiner Gamma and Olbers A exhibit definite similarities.

Reiner Gamma exhibits a total lack of elevation and other forms of relief. For example, I find no association with sub-telescopic secondary impact craters. This writer has conducted a search of Lunar Orbiter photographs showing no conclusive evidence of higher cratering within the boundary of the deposit than in the surrounding terrain. Lunar Ray systems, on the other hand, exhibit an increase in crater counts within their higher albedo units as compared with surrounding terrain. (4).

D.W. Arthur noted that mare ridges similar to those transecting Reiner Gamma to possess slopes 20-50 meters high as measured in other areas. Ridges transecting the deposit cast shadows on telescope photos of the region when taken at low solar illumination. But the deposit itself shows no signs of shadows. Thus, the maximum thickness of the deposit is suggested as approx. < 10 meters.

This brings us to the question of origin. Unfortunately, we have no mineralogical samples from these locations. Owing to the lack of physical data besides the significant discovery of a magnetic anomaly associated with this feature (6), we must learn the origin of such rare features from indirect methods, such as telescopic observation, photography and other imagery, photometric, and indirect data from the Apollo, Lunar Orbiter, and Galileo Missions.

There are several leading theories as to the origin of Reiner Gamma and the other swirl features. These include cometary impact, antipodal effects of major basin formation (seismic wave effects), unusual lunar ray systems controlled by the high magnetic fields located at these locations, solar magnetic storm phenomena, and the gaseous alteration from lunar volcanism, to name a few. (5).

We shall here primarily consider the most accepted, that of cometary impact and antipodal effects of major basin formation impact events.

Due to the heavily cratered nature of the surface of the moon and Mercury, it is a natural assumption (assuming impact as the mechanism of most lunar cratering) that at least some of these craters are due to the impact of cometary bodies, especially in light of mass extinction theories, in which major "showers" of comets from the Ort cloud caused extinctions such as that of the dinosaurs.

It has been suggested that the Swirl features indigenous to the Moon and Mercury are of such cometary origin (6). The problem exists as to how to distinguish cratering resulting from cometary impact from that produced as the result of meteoroid impact.

In the cometary impact view of the origin of the lunar swirl features, it was proposed that Reiner Gamma, and those swirls found on the lunar far side, are the result of the impact of a split nucleus comet, with at least two impact points identified: the far side crater Goddard A marking the point of impact of one of these nucleuses, whereas a smaller crater on the rim of O'Day would mark the second point of impact. (6).

Thus, these swirl patterns could be the result of high-velocity imprinting of cometary dust and the fine structure of the coma. The age of these patterns has been suggested as 10 years (6), making these patterns relatively young lunar features.

The idea of fragmented cometary structures orbiting within the inner solar system is nothing new. In recent months this has become especially apparent considering the forthcoming encounter between comet Shoemaker-Levy 9 and the planet Jupiter. Additional examples of such fragmented (split nucleus) comets can be cited, such as comet West (1976). Comet Brooks 2 (1886) may also be an example fragmented from the gravitational forces of Jupiter. Evidence of such multiple nucleus comets impacting solar system bodies may be cited. For example, Ganymede exhibits "lined up" craters that suggest the impacting body to have been that of such a multiple or split nucleus object (14). Callisto boasts 13 similar examples, including Gipul Catena, a 620 km impact crater chain (17).

Lunar counterparts for such alignments are not unusual. One choice example lies east of Walter (near Long. 6.45, Lat. -42.41, see IV-107-H3), consisting of an alignment of 6 craters closely matching the Gipul Catena feature on Callisto. While many of these probably resulted from secondary impact of major crater ejecta, it is logical to assume that multiple nucleus cometary impacts are responsible for others. This brings forth the possibility of a new observational program for the identification and cataloging of aligned craters.

It is important to note that besides the swirl pattern at Reiner Gamma, a relatively strong field of magnetization has also been discovered, and other magnetic anomalies in other regions that include those containing the far side swirl features (Hood, 1979). This association could be explained by the cometary-impact model, in which the impacting coma and tail have caused deposits and possibly altered the physical properties of the upper regolith in these locations. Shultz and Srnka suggested the impacting coma gases could have produced concentrations of magnetite in the dark areas of these swirls. (6).

The absence of a global magnetic field on the Moon is a well established fact, dating from the early days of lunar probes. These strong localized magnetic fields found in association with the swirl features, in addition to lunar samples displaying strong, stable components of natural remanent magnetization (NRM) add credence to both the cometary impact and the antipodal magnetization theories discussed below, and are cited as possible evidence to support each model. Strangway (1973) proposed the hypothesis that lunar magnetic anomalies were the result of meteoroid impacts (18).

The second view considered here on the origin of the Swirl patterns suggests quite a different scenario from that proposed in the cometary impact model. It has been suggested that major Mare formation (i.e., the Imbrium impact event) lead to antipodal effects, such as subdued pits, hillocks, fractures, and chaotic textures (9), besides the swirl features.

In this hypothesis, the swirl markings on both the Moon and Mercury are attributed to be the result of major impacts diametrically opposed (antipodal) to the swirl's positions. It is noted that the swirl features found at Mare Inginii, Mare Marginis, and on Mercury are located directly antipodal to Mare Imbrium, Mare Orientale, and the Mercurian Caloris Basin, respectively.

While Reiner Gamma is typical of the lunar swirls, it must be noted that it is not located at the antipode of a major basin, although some argument can be made as to its antipodal source being the far side feature Tsiolkovsky.

Hood (et al., 1979) noted magnetic signatures at the antipodes of 26 ringed impact basins, the strongest of which were at the antipodes of young ringed basins. All the Lunar Swirl features are correlated with such strong magnetic anomalies, with the Reiner Gamma feature marking the position of the strongest of these. Also, it was noted in the same work that even the older basins reflected fields at their antipodes, although these fields were relatively weak. All these observations seem to strengthen the antipodal basin point of view.

In closing there is another possibility that I will address briefly, the possibility that lunar and Mercurian swirl features might be the result of impact ejecta acted upon by localized fields of magnetism, independent of the impact event producing the anomalies themselves. Thus, both these theories might be necessary to explain these swirl patterns. In both cases, it has been suggested that these magnetic anomalies and the swirl patterns themselves resulted in some way from the impact of another body with the surface of the moon.

Both models attempt to explain the magnetic anomalies described above, and either could explain the swirl patterns as the result of ejecta having been acted upon by these fields of magnetism.

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3. Bowker, D.E. and Hughes, J.K., Lunar Orbiter Photographic Atlas of the Moon, NASA SP-206

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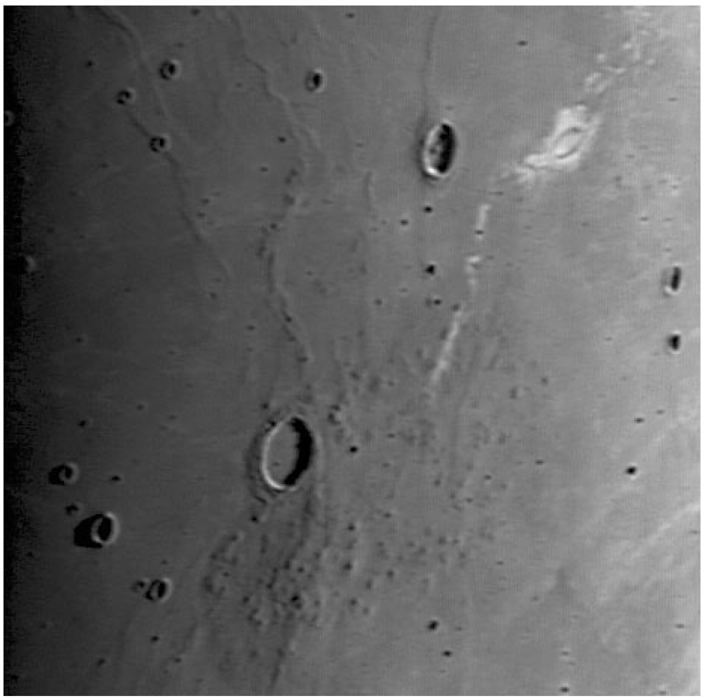
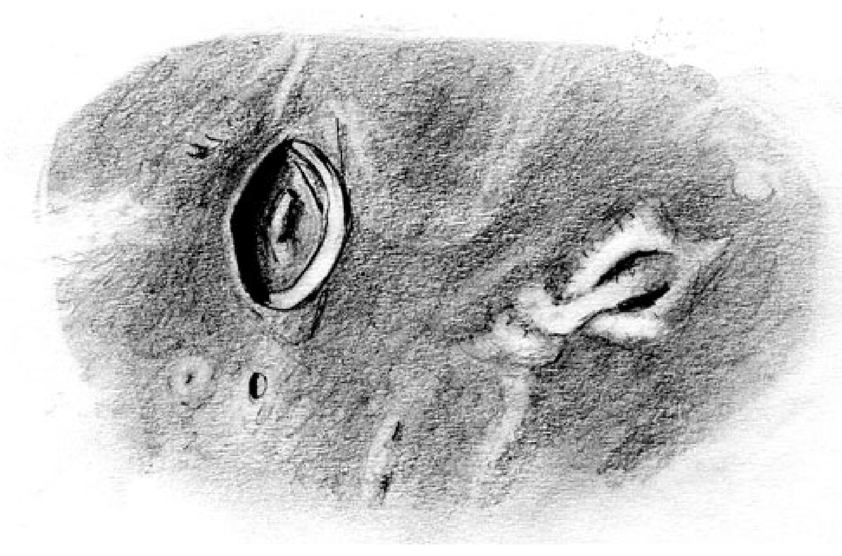
OBSERVATIONS OF REINER GAMMA



REINER GAMMA
Digital Image by
K.C. Pau - Hong Kong, China

October 9, 2004 - 21:13 UT
212mm Newt-Cass
Phlips Toucam Pro
100 frames stacked



REINER GAMMA
Sketch by
Robert Wlodarczyk
Czestochowa, Poland

November 17, 2002
23:45 UT
150mm Newt. - 150x

LUNAR TRANSIENT PHENOMENA

Coordinator – Dr. Anthony Cook – acc@cs.nott.ac.uk
Assistant Coordinator – David O. Darling – DOD121252@AOL.COM

LTP NEWSLETTER - MARCH 2005

David O. Darling - Assistant Coordinator

Observations for the month of January 2005 have been received from Michael Amato (USA), Clyde Brook (UK), Albino Carbognani (Italy), Anthony Cook (UK), Marie Cook (UK), David Darling (USA), Robin Gray (USA), Gerald North (UK), Raul Salvo (Uruguay), Frank Serio (USA), Don Spain (USA), Robert Spellman (USA), and Myron Wasiuta (USA). Four out of the eleven countries represented by the observing network submitted observations. For this month eleven days were covered giving us a 27.5% coverage for this lunation, these dates are 2nd, 15th, 17th, 19th, 21st, 22nd, 23rd, 24th, 25th, 26th, and 28th. .

During the observing period 30 lunar features were monitored this month. Those listed in bold are those that had L.T.P. reported. Those observed more than once are followed by the number of separate observations presented. Aristarchus = 8, Aristoteles, Aristillus, Atlas, Alphonsus, Baily, Caucasus Mts, Cape Agarum, Cobra Head, Daniell, Earthshine, Eudoxus, Gassendi, Grimaldi, Hercules, Janssen, Langrenus, Linnie, Madler, Mare Crisium = 2, Mare Nectaris, Messier Twins, **Mutus F**, Plato = 4, Proclus = 5, Petavius, Stofler, Theophilus, **Torricelli B = 8**. More will follow concerning the Torricelli B report as the observations are examined in greater detail.

This month I want to bring us all up to date on where we are concerning the Smart 1 mission to the Moon and as a team of observers. As a group of observers I believe that we are in a unique position and better prepared than any past program to document this elusive lunar transient phenomena.

Before we proceed further we should take a look at past observing programs and their accomplishments and failures, and learn from these earlier attempts to monitor the Moon on a world wide basis.

The first group was very active during the Apollo 10 through 12 missions which took place from May 1969 to November 1969 when astronauts were in orbit around the Moon and from Apollo 11, walking on its surface. This program was an international group of observers called the Lunar International Observing Network or LION, under the leadership of Miss Barbara Middlehurst who had been doing this for several years, and now included 215 astronomical observing stations in 30 countries. Her network consisted of professional and amateur astronomers who were interested in the study of lunar transient phenomena. Through pre-planned, and concentrated observing efforts this network had the ability to monitor the surface of the Moon 7 days a week and 24 hours day. The main objective of this program was to record the nature, magnitude, frequency and distribution of the lunar transient phenomena. They had high hopes of having independent confirmation of an event from widely separated ground based locations.

The following was reported in the Smithsonian Institution Center for Short-Lived Phenomena Annual Report 1969 "During the Apollo 10,11,12 missions the Center for Short Lived Phenomena received a total of 169 TLP reports in 31 areas from 28 observing stations in 19 countries."

"At least six series of simultaneous or overlapping TLP observations were reported during the Apollo 11 mission. These were all made in the crater Aristarchus on 19 July 1969 between 1845 to 2400 GMT. At least 12 observers from 6 countries on two continents and in lunar orbit made either simultaneous or over-lapping observations of Aristarchus activity during this 5 hour and 15 minute period."

Between 1845 and 1847 GMT the Apollo Astronauts reported "Illumination" on the northeast wall of Aristarchus. Pruss and Witte (Institute for Space Research, Bochum, Germany) independently reported a 5 to 7 second ½ to 1 magnitude brightening of Aristarchus at 1846 GMT. Between 1930 and 2400 GMT Gervais (Lodeve, France), Oliver (Sabedel, Spain), Da Silva, Mourao, and Cardoso (Rio de Janeiro, Brazil), Moseley (Armagh, Northern Ireland), and Vasquez (Valparaiso, Chile) all reported activity in Aristarchus."

"These observations represent the first reported simultaneous or over-lapping TLP observations 1) from Astronauts in lunar orbit and ground-based observers, and 2) from ground based observers on different continents."

The next ground based observing programs that worked in conjunction with one another was the Argus Astronet which consisted of a rather interesting group of amateur astronomers who were also "radio hams" combining their two amateur interests by exchanging their reports of lunar observations in real time by radio. Their reports were carefully monitored by the Corralitos observing staff using a Drake 2B short wave receiver. A large number of events that were reported were immediately checked by the staff of the Corralitos Observatory Program for the Detection of Lunar Transient Phenomena. Unfortunately, there were no confirmations made by Corralitos Observatory that were reported by Argus Astronet. To learn more about this program you can read NASA CR-147888 The Corralitos Observatory Program for the Detection of Lunar Transient Phenomena.

The next program consisted of the Moon-Blink-Operation when a device was developed by J.J. Gilheany of Trident Engineering Associates. This detector combines an image converter tube with a rotating filter wheel that intercepts the telescope image of the Moon. The tube views the Moon alternately through red and blue filters, but the light intensities are balanced so that the observer sees no noticeable flicker in the final black-and-white image, under normal conditions. More can be learned about this program by reading the article in Sky & Telescopes March 1966 on page 137. Not much more was printed about this program so what ever became of the results and the special instruments developed may never be known.

The next program that took place was the one fielded by three amateur astronomers, members of Madison Astronomical Society of Madison, Wisconsin. They were Robert Manske, David Weier, and myself. We organized a ground based observing program during the Clementine mission to the Moon. From a list 75 observers from all parts of the world 51 people responded affirmatively, and of these 33 submitted reports. We received reports for 30 nights during the period from 28 February to, 28 April 1998. During this time period 324 observations were submitted, and 30 L.T.P. reports were submitted.

The Lunar Prospector mission which lasted for about 1 year, and was the next opportunity that I had to coordinate observers to monitor the Moon for L.T.P. From a list of 75 observers from around the world 20 responded affirmatively. 16 people submitted 246 observations. Of these observations 32 were reported as possible L.T.P. events.

This brings us up to present day where we are waiting for the skies to clear so we can monitor the Moon for the Smart 1 mission. For this mission I have sent out over 1000 invitations to individuals and astronomy clubs from around the world to join me in watching the Moon for L.T.P. events during the up coming Smart 1 mission. To date, I have had about 90 individuals respond with some already sending in observations. These observers are located in 19 countries all around the world, with the greatest concentration of observers being located in the United States.

The mission is a “go” and the Smart 1 spacecraft has been sending back its first photographs. I want to encourage you to begin observing and just as important to submit your observations of what you saw. Good intentions is the first step toward a great observation. This project will be successful when observers will take the next step and send in their reports whether they are just a routine report or the more exciting L.T.P. event. When all the data is submitted and pieced together the Moon comes alive as it only can when it’s being monitored 24 hours a day 7 days a week.

We have a great opportunity to make a real contribution to science with this mission and continues long into the future. There will be many upcoming moon shots preceding mankind’s return to our nearest neighbor, beckoning us to return to the eyepiece and once again view the stark beauty that our nearest neighbor displays.

Good Hunting!

MOON MISSIONS

SMART-1

SMART-1 Homepage**:**
http://smart.esa.int/science-e/www/area/index.cfm?fareaid=10

Astrobiology Magazine on propulsion and instrumentation:
http://www.astrobio.net/news/article1417.html
http://www.astrobio.net/news/article1452.html

ESA article on the extension of the mission:
http://www.esa.int/export/SPECIALS/SMART-1/SEMAQ7YEM4E_0.html

NASA & NRO JOINT MISSION

http://www.space.com/spacenews/businessmonday_050131.html

LUNAR DOME SURVEY

Acting Coordinator – Marvin W. Huddleston – kc5lei@comcast.net

Those participating in the A.L.P.O. Lunar Dome Survey are urged to use the new reporting form shown on Page 20 of this issue. For stimulating discussions on domes you should join the Dome Discussion Group by sending an email to: **lunar-dome-subscribe@yahoogroups.com** For more information about the Dome Survey please contact the Coordinator at the email address shown above.

A.L.P.O. LUNAR DOME SURVEY
Observation Form

Submit electronically (attach photographs and scanned drawings to e-mail) to:

***Marvin W. Huddleston*, F.R.A.S.**
kc5lei@comcast.net
or via mail:
2621 Spiceberry Lane
Mesquite, TX 75149-2954

<table>
<tr><td>Observers Name:</td><td colspan="5">Last:</td><td colspan="5">First:</td></tr>
<tr><td>Date: (UD)</td><td colspan="3">Month:</td><td colspan="4">Day:</td><td colspan="3">Year:</td></tr>
<tr><td>Time: (UT)</td><td colspan="5">(UT) Hours:</td><td colspan="5">(UT) Minutes:</td></tr>
<tr><td>Colongitude:</td><td colspan="10"></td></tr>
<tr><td>Region Observed:</td><td colspan="10"></td></tr>
<tr><td>Telescope:</td><td colspan="5">Size (Inches or Cm.):</td><td colspan="5">Type:</td></tr>
<tr><td>Eyepieces Used:</td><td colspan="3"></td><td colspan="2"></td><td colspan="3"></td><td colspan="2">Filters:</td></tr>
<tr><td>Seeing (Circle)</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>Transparency:</td><td colspan="10"></td></tr>
<tr><td>Type of Observation (list details):</td><td colspan="5">Visual:</td><td colspan="5">Photographic:</td></tr>
</table>

Domes Observed (Positions)

Xi	Eta	OR	Lunar Long.	Lunar Lat.

Notes: (**Include Observer Location (City, State, and Country) Here**; Use back if necessary):