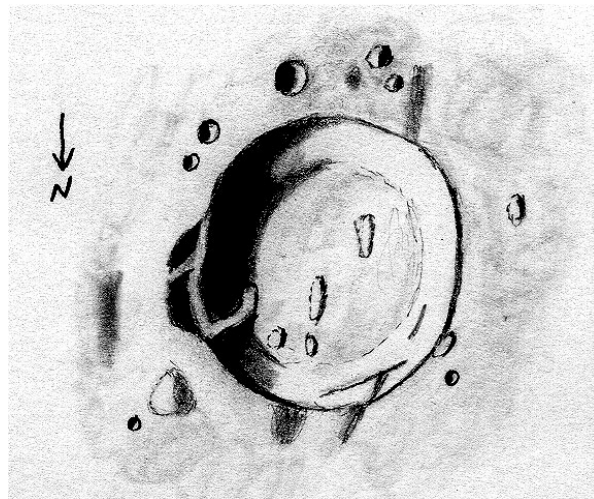




# THE LUNAR OBSERVER

A PUBLICATION OF THE LUNAR SECTION OF  
THE ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS  
EDITED BY: William M. Dembowski, F.R.A.S. - Elton Moonshine Observatory  
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## FEATURE OF THE MONTH - NOV. 2004



### TACITUS

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

**April 27, 2004 - 02:58 to 03:04 UT**

**15cm Newtonian Reflector - 170x - Seeing 8/10**

I sketched this crater on the evening of April 26/27, 2004 while observing two occultations. This is a fairly large crater that lies west of the Theophilus-Cyrillus-Catharina trio. It really doesn't have a central peak, but an assortment of four elevations scattered around its floor. It has a somewhat polygonal shape with flattish rims to the west and southwest. There is also a large slump in its eastern rim that has left a sunlit L-shaped ridge and shadowing that I sketched as I saw it. It must be a fairly deep crater with much interior shadow well away from the terminator, but there is little evidence of a raised rim. Tacitus N is a modest crater near the south rim of Tacitus, while Tacitus R and a smaller pit are farther to the northeast. The LQ map shows R and its neighbor in contact, but I clearly saw them separate.

There was a little group of hills west of Tacitus N and another peak west of Tacitus. The small crater just northwest of Tacitus is Tacitus X, and an unnamed pit is to the northeast near a triangular shaped elevation. Tacitus had complex interior shadowing that indicates much terracing; I have tried sketching it as well as possible.

**EDITOR:** Tacitus and its surroundings can be found on Map 57 in Rukl's Atlas of the Moon.

# **LUNAR TOPOGRAPHICAL STUDIES**

Acting Coordinator – William M. Dembowski, FRAS

[dembowski@zone-vx.com](mailto:dembowski@zone-vx.com)

## **OBSERVATIONS RECEIVED**

KLAUS BRASCH - HIGHLAND, CALIFORNIA, USA

Digital images of Bullialdus, Clavius (2), Copernicus & Eratosthenes, Copernicus (2), Ptolemaeus, Theophilus

ED CRANDALL - WINSTON-SALEM, NORTH CAROLINA, USA

Digital images of Alpine Valley, Oceanus Procellarum, Mare Crisium, Petavius to Langrenus, Cleomedes, Mare Imbrium

DANIEL DEL VALLE - AGUADILLA, PUERTO RICO

Digital images of Clavius, Copernicus, Goldschmidt, Tycho  
Sketches of Neper, Triesnecker

COLIN EBDON - COLCHESTER, ESSEX, ENGLAND

Sketches of Triesnecker to Ukert, Apollonius & Furmicus & Mare Spumans, Boscovich

HOWARD ESKILDSEN - OCALA, FLORIDA, USA

Digital images of North Polar Region (2), Eastern Mare Imbrium (2), Full Moon, Eastern Seas and their Rays, Triesnecker & Hyginus, Hortensius Domes, Ptolemaeus Chain and environs, Tycho & Clavius (2), Copernicus to Stadius

RAFFAELLO LENA - ROME, ITALY

CCD images of Mare Tranquilitatis & Serenitatis, Eastern Full Moon, Copernicus & Kepler rays

K.C. PAU - HONG KONG, CHINA

Digital images of Kepler ray system (2), Seleucus, Marius, Schickard

ALEXANDER VANDENBOHEDE - GENT, BELGIUM

Digital images of Proclus & environs (2)

ROBERT WLODARCZYK - CZESTOCHOWA, POLAND

Sketches of Kepler ray system, Bright plateau and rays of Lalande, Maurolycus & environs, Bright region around Manilius  
Photograph of 18-day Moon

CARMELO ZANNELLI - PALERMO, SICILY, ITALY

Digital image of Endymion & Atlas

# **LUNAR VOLCANIC CONES - BACKGROUND**

**Raffaello Braga**

Lunar volcanoes consist mainly of low-profile domes (shields) located in those regions where the magma reached the surface and are associated with other characteristic features such as lava flows and channels, as in the region of the Marius Hills or in the Aristarchus Plateau, although isolated lunar domes can also be found both in the maria and in the highlands. Domes are formed by the localized extrusion of relatively viscous lava or by subsurface intrusions. In the first case the term “shield” – by analogy with the shield volcanoes on Earth, would be more appropriate but it is the word “dome” that prevailed in the lunar literature.

The most common eruptive style on the Moon, however, is the effusion of lava through crustal fissures, the lunar analogue of the terrestrial flood basalt eruptions that formed the so-called continental flood basalt provinces such as the Columbia plateau in the U.S. Fissure eruptions are characterized by the emission of huge volumes of magma that form flows up to hundreds of kilometers long covering immense surfaces, as one can see on the floor of the Earth-facing lunar impact basins. The effusion of lava is always accompanied by pyroclastic activity whose extension and power depends on the physical properties of the magma and on the eruption environment. The fragmentation of the melt by the exsolution and expansion of the dissolved gases lead to the formation of small cinder cones often aligned along the fissures or clustered around the eruptive vents [1] [2] [3].

Lunar cones are in general of very small dimensions compared to their terrestrial counterparts because of the difference in the eruption mechanisms that take place on the Earth and the Moon, which are determined by a number of environmental and geological factors [4]. Although sometimes referred as the lunar equivalent of the terrestrial cinder cones, many volcanic vents on the Moon are simply holes in the ground that did not form true cones with steep slopes. This is the case of the dark haloed craters, which can be recognized only on the base of the low albedo material that has been ejected around them. DHCs has been catalogued by the Association of Lunar and Planetary Observers [5] but much work is still to be done on the shape of the eruptive vents.

## **REFERENCES**

- [1] Wilson, L., Head, J. W., Lunar Volcanic Cones and Dark Mantling Deposits: Consequences of Patterns of Volatile Release, LPSC X, P. 1353-1355, 1979.
- [2] AAVV, Basaltic Volcanism on the Terrestrial Planets, LPI, Houston, 1981  
(<http://ads.harvard.edu/books/bvtp/>)
- [3] Wilhelms D.E., The Geologic History of the Moon, USGS Professional Paper 1348, Washington, 1987
- [4] Head, J. W.III, L. Wilson, Absence of large shield volcanoes and calderas on the Moon: Consequence of magma transport phenomena, Geophys. Res. Lett., 18(11), 2121-2124, 10.1029/91GL02536, 1991.
- [5] Garfinkle R. A., ALPO Lunar Dark-Haloed Crater Catalog: Updated, Corrected and Amended, JALPO 40, 4, 181-184, 1998

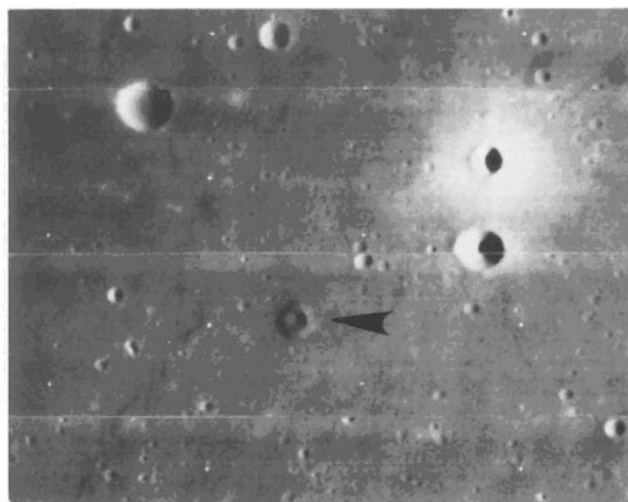
# **LUNAR VOLCANIC CONES - A PROJECT PROPOSAL**

The above said, I would like to propose to TLO readers a survey program on lunar cones having the objective of classifying them similarly as it has been done for the lunar domes. This activity will be part of the ALPO topographical studies coordinated by William Dembowski, FRAS. As cones are very small, most of the work should be carried out on the photographic material collected by spacecraft, which is partially available on the Internet, however good telescopes of 20 cm aperture or more can be very helpful in locating suspected features particularly on the highlands and along the mare edges. The results of the survey will be published in TLO and the ALPO Journal. Observers interested in the above proposal can contact me at the email address below.

Raffaello Braga  
British Astronomical Association – Lunar Section  
Geological Subsection  
Email: rafbraga@tin.it

I would like to add my support to Raffaello Braga's proposal for a joint ALPO/BAA effort in the area of lunar volcanic cones. In addition to the appeal of investigating a much understudied class of lunar features, this project opens the door to participation by all lunar enthusiasts regardless of the sophistication of their equipment. By employing spacecraft generated imagery this project places the possibility of performing front-line scientific research within the reach of anyone with the facilities to read this article. I urge anyone interested in doing more than just casual sightseeing on the Moon to respond to this call and help get the project off the ground.

William M. Dembowski, FRAS  
Association of Lunar & Planetary Observers  
Acting Coordinator, Lunar Topographical Studies  
dembowski@zone-vx.com

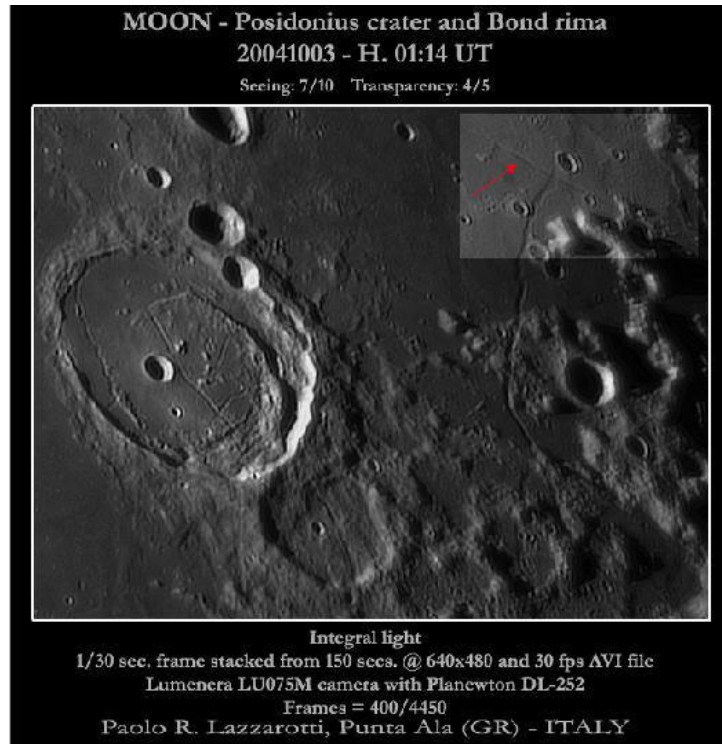


**NASA Image - Lunar Orbiter IV-113-H2**  
**Lunar cone (see arrow) approximate diameter - 3.5 km**

# RIMA NEL LACUS SOMNIORUM

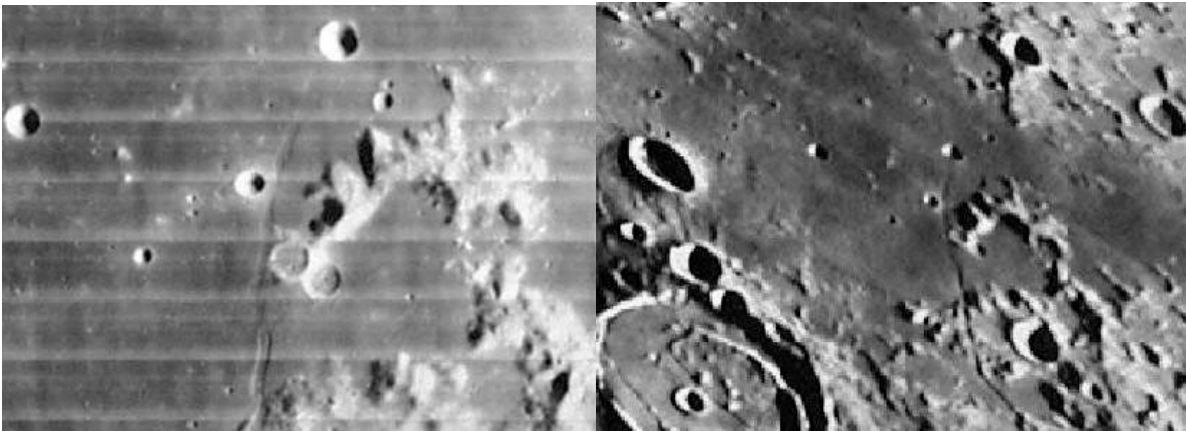
**Antonio Marino**

**EDITOR:** The following is an article submitted by Antonio Marino, Coordinator of the Topography Research Program for the lunar section of the Italian Union of Amateur Astronomers (UAI). It is also located on their website at: <http://www.planetmoon.org>



**FIGURE 1**

From a shot during the observation effected by Paolo Lazzarotti on Oct. 3, 2004 - 01:14 UT (Figure 1), a rille is north from the known G.Bond rille. It extends orthogonally to G.Bond rille, overlapping for a short tract - therefore creating a T-shape formation. From a search of the existing atlases such as Lunar Orbiter Image IV-079-H1 (Figure 2) and Consolidated Lunar Atlas b3 (Figure 3) this rille is not visible in the light conditions during the satellite shooting.

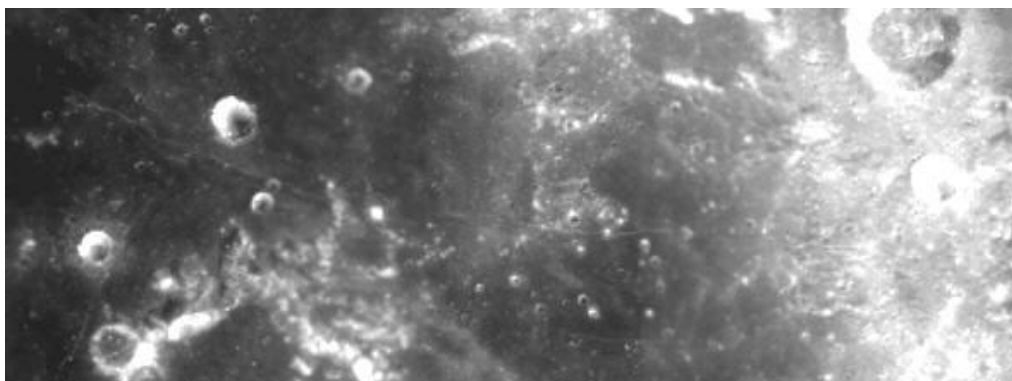


**FIGURE 2**

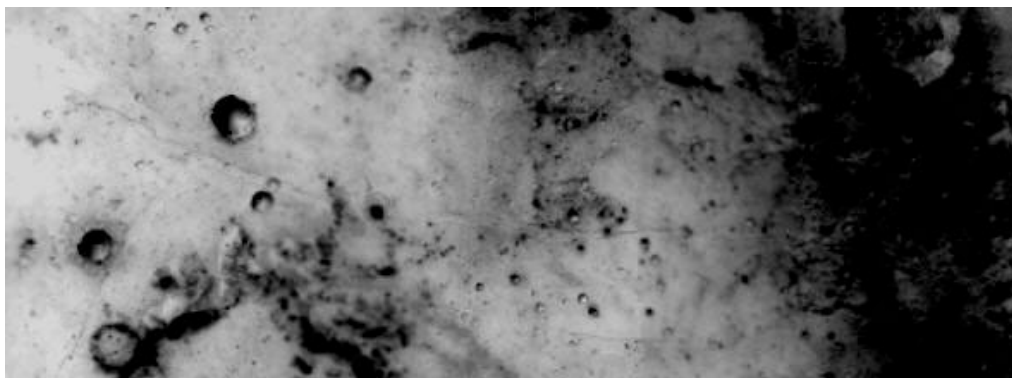
**FIGURE 3**



The only evidence of the rille's existence is in the PDS Map-A-Planet; the picture (Clementine) is identified as 1097399465. In this picture a long rille is well visible - stretching along the Lacus Somniorum's eastern edge (Figures 4 and 5)

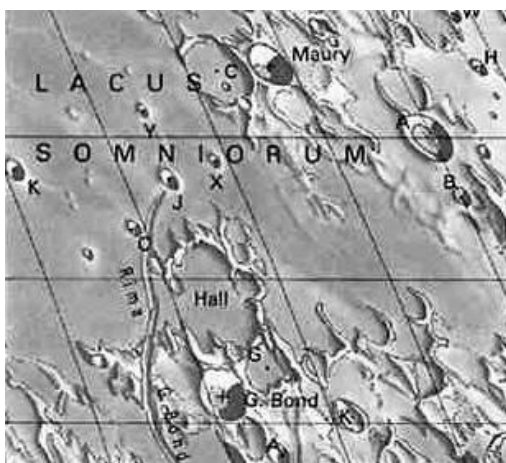


**FIGURE 4 (Positive)**

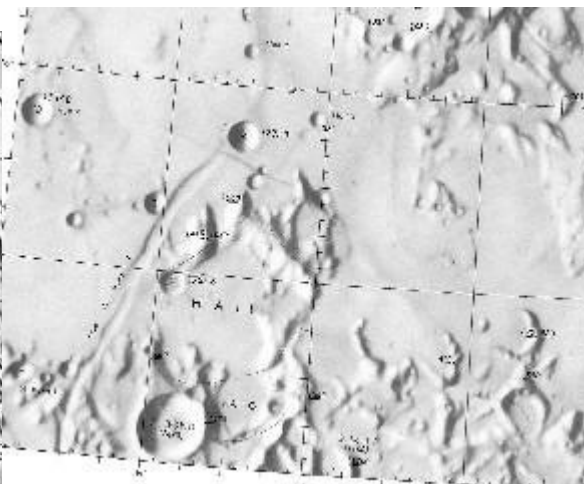


**FIGURE 5 (Negative)**

As it is visible in Clementine image detail, a long rille stretches along the Lacus Somniorum eastern edge. It extends from West to East and ends just close to the southern area of crater Maury B. Its size should be roughly 240-250km. For about 45-50km it stretches westward from the G.Bond rille and for the remaining 190-200km eastward from the G.Bond rille. Its trajectory is probably interrupted by a small crater visible in Figure 4 (in this case it appears very bright). The maximum width should be 3-3.5 km. Even Rukl Atlas does not show the rille (Figure 6). Lunar chart no. 27-LAC shows it only partially (Figure 7).



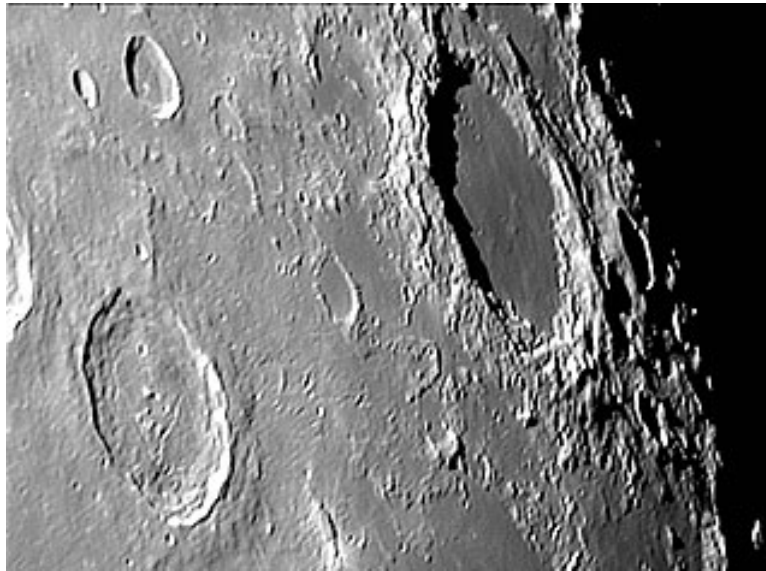
**FIGURE 6**



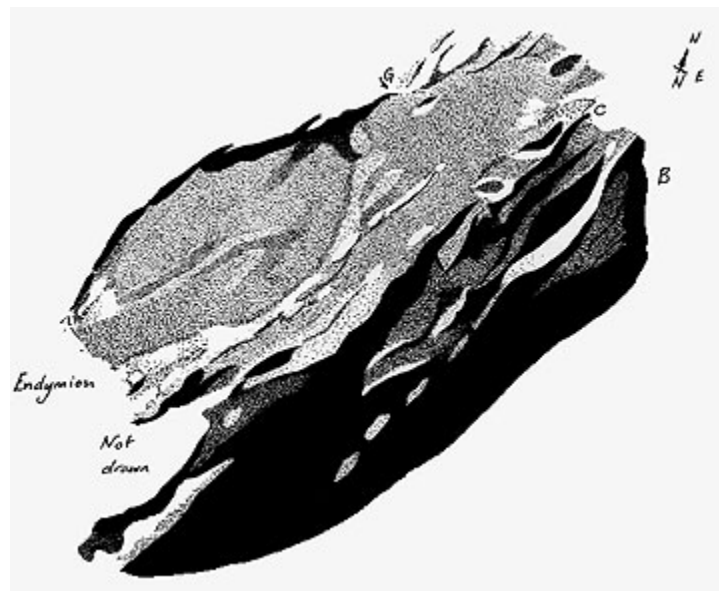
**FIGURE 7**

## **LUNAR CHALLENGE: Wrinkle Ridge in Endymion**

Based on a sketch by Peter Grego (Rednal, Birmingham, England) we issued a lunar challenge last month for observations of a ridge on the floor of the crater Endymion. Although the challenge remains open, here are two observations which verify Peter's sighting. Thanks to both gentlemen for sharing their observations.



**Digital Image by Carmelo Zannelli - Palermo, Sicily, Italy  
September 30, 2004 - 22:00 UT - Seeing 6/10  
180mm Maksutov-Newtonian - 498 Frames Stacked**



**Sketch by Colin Ebdon - Colchester, Essex, England  
November 24, 1999 - 23:15 to 00:15 (Nov.25) UT  
10 inch Newtonian - 183x & 236x - Seeing AIII**

## **LETTER TO THE EDITOR:**

Letters to the editor are always welcome. This letter is from Peter Grego and was prompted by an exchange of personal emails concerning the Lunar Challenge mentioned above. Peter is, among other things, Director of the Lunar Section of the Society for Popular Astronomy, Editor of its circulars and Popular Astronomy quarterly, a regular columnist for Astronomy Now magazine, and author of both "Collision: Earth" and "Moon Observer's Guide".

\* \* \* \* \*

"You know, it's still surprising how much we don't know about the Moon's topography - take this as an example. On the LAC charts, Endymion isn't covered. The CLA doesn't really show it in any detail, nor does Lunar Orbiter. So, we're still reliant a great deal on amateur observations to confirm quite a large and obvious feature seen through a backyard 'scope!

There are, as you know, things like this thrown up in most detailed amateur observations of the Moon - features of low relief that are obvious only under very low illumination. There's still plenty of chance for amateur discoveries to be made, albeit small ones, but discoveries of topographical features nonetheless. Until the Moon's near side is mapped in great detail - ie, mapped by radar to give heights accurate within a few tens of metres, then the amateur lunar observer will not be redundant. Then again, even if the surface of the Moon were known in inch-detail, there would still be people like us eager to view it, regardless, because we admire the Moon's topography so much, and we're keen to learn our way about Luna!"

----- **Peter Grego, FRAS**

## **AN INTRODUCTION TO LUNAR PHOTOGRAPHY**

**Jack Kramer - Lily Lake, Illinois, USA**

When I first got a telescope with a motor-driven mounting, I decided to try my hand at photography through the telescope. Having no patience for long-tracking exposures of faint fuzzies, I looked elsewhere. The moon is a bright target with lots of detail. That was a good starting point. But getting a really good shot is just a bit harder than it looks.

One problem was addressed in the book *Introduction to Observing and Photographing the Solar System* by Dobbins, Parker, and Capen. The authors state: "The Moon presents a special problem for the astrophotographer. As the Moon waxes and wanes, the angle of incidence of sunlight changes. Also, there is a wide range of brightness between the limb and terminator regions." As a result of this varying angle of incidence, it's impossible to take a single shot of the moon that will show the same level of detail uniformly over the entire surface. Photographic atlases of the entire lunar surface are invariably based on many images taken during various phases.

The fact that the moon is such a bright body means that you don't need a fast film and the exposure can be relatively short. In fact, you're more likely to overexpose your shot of the moon than underexpose it. Thus you can use slower, finer-grained films that will show better detail in the finished shot. On the other hand, faster films allow very short exposures, which minimize an out-of-focus appearance due to tracking errors and tremors in the telescope due to shutter slap.

When it comes to shutter speed, books on astrophotography often provide formulas that take into account the varying luminance of the moon. It's a moving target because each lunar phase is slightly different. Always bracket your exposures; in other words, use a range of shutter speeds.



By way of example, using a 4-inch refractor with negative projection (a 2x Barlow lens and no eyepiece or camera lens) with Kodak Royal Gold 400 film and the moon at first quarter, the best results were with a shutter speed around 1/8 second. But there wasn't actually a great difference in the resulting prints when compared to the bracketed exposures on either side - 1/4 second and 1/15 second. Using this same setup with Fuji Neopan 1600 B&W film, the best results were in the range of 1/15 to 1/60 second.

If it were prime focus, then the shutter speeds could be faster. The light gathering ability of a larger telescope would also make it possible to use a faster shutter speed. If you further magnify the image by shooting with an eyepiece in the telescope, then you've made the image fainter and must compensate with a longer exposure. Using the "afocal" method, with both an eyepiece and camera lens, would call for further increasing the exposure. Images taken at lower magnification will naturally appear sharper, so they're more "aesthetically" pleasing. If you want to home in on some minute detail, then this will really test your system.

The most difficult of all shots are the ones combining the moon with some other object. The moon will always be considerably brighter - a difference for which your eyes compensate quite well, but not the camera. On one occasion, I was photographing the occultation of the star Aldebaran, so it was necessary to achieve an exposure that would show the moon as well as the much fainter star. With ISO 800 film and just a three-day-old moon, the moon was overexposed on every frame. I thought the images would come out much fainter and had not bracketed enough. This makes you greatly appreciate the skill of those who get a good photo of the moon occulting a planet!

Today more people are doing astrophotography with an ordinary digital camera or webcam, and they're way ahead of film in terms of achieving satisfactory results. Most of the same rules apply as in film photography. Since the exposures are very short, surprisingly good results can be achieved just by hand-holding the camera. But for the very best results, the camera should be securely mounted to the eyepiece. A self-timing shutter feature or remote shutter release on the camera will help ensure there are no jiggles at the moment of exposure. Of course, with a digital camera, there's no shutter slap.

Digital cameras are more sensitive than most film, so there is an even greater tendency to over-expose. Once over-exposed it's impossible to retrieve fine details that have been burned out of the image. But a digital image lends itself nicely to image processing, since you don't have the intermediate step of scanning a film-based photograph. Plus digital imaging is far easier than with film, in large measure because you can view your target on the camera screen or monitor while taking the image. This allows you to adjust the exposure for the varying illumination mentioned earlier. Although you have a pretty good idea how the resulting image will look, it's still a good idea to do some bracketing. It's also possible to use a dedicated CCD camera for lunar imaging, but since CCDs are extremely sensitive, the exposures must be very short.

You can use image processing software on your computer to sharpen the image, brighten it, and otherwise improve it, but you can't show something that isn't there to begin with. Processing merely brings out any hidden details. The best lunar images are taken with telescope/eyepiece combinations that provide good resolution and high contrast. And there is no substitute for a night with good seeing; if the visual image is unsteady, then the digital image will be disappointing.

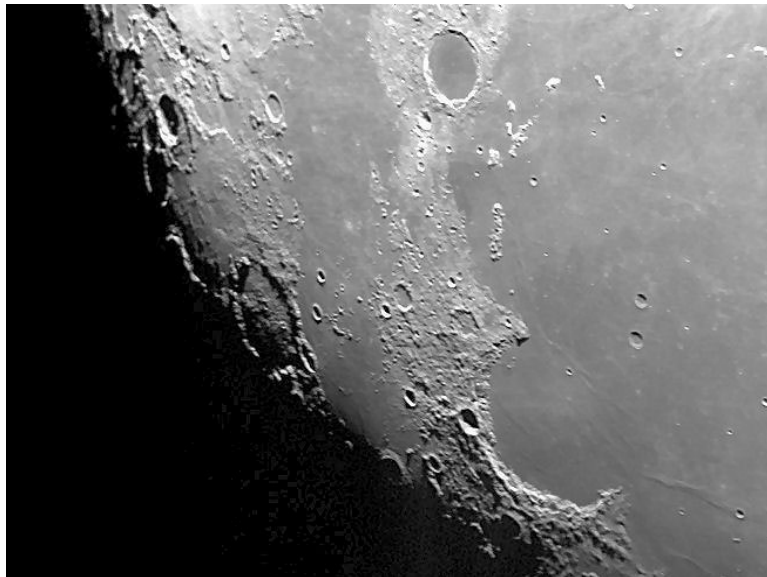
My decent shots are largely a result of learning by trial and error. Out of 24 exposures on a roll of film, I typically was lucky if there were three or four reasonably good shots of the moon. Since acquiring a digital camera in 2000, I have achieved far better results and have completely abandoned film. Finally, for an image to have scientific value, it's important to know all the details about when it was taken and with what sort of instrument. Almost every image-processing program allows you to imprint text right in the image, and I've found this to be the easiest way to keep track of the particulars. Don't recall the exact time when an image was taken? Many digital cameras record the time and date of the picture in the image properties so, on your computer, if you point your cursor on the original (unprocessed) image file, a small box will pop up showing that info. Though your camera may be set to the correct time, verify whether it adjusts for daylight savings time (mine doesn't).

## **RECENT TOPOGRAPHICAL OBSERVATIONS**



**BULLIALDUS**

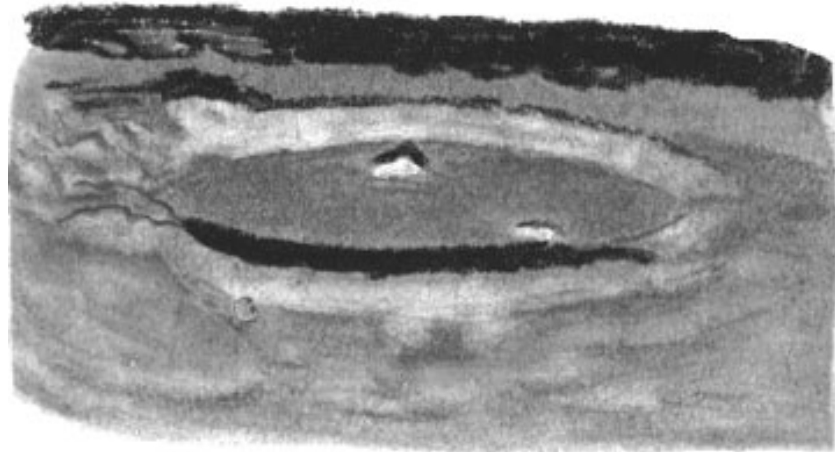
**Digital image by Klaus Brasch - Highland, California, USA  
July 6, 2003 - 14 inch SCT - Nikon Coolpix 995**



**MARE IMBRIUM**

**Digital image by Ed Crandall - Winston-Salem, North Carolina, USA  
September 25, 2004 - 01:49 UT  
10 inch f/7 Newtonian - SLX HX 516 CCD Camera**

## **RECENT TOPOGRAPHICAL OBSERVATIONS**



→ N

### **NEPER**

**Sketch by Daniel del Valle - Aguadilla, Puerto Rico**

**September 29, 2004 - 01:00 to 01:22 UT**

**120mm Refractor - 222x - Seeing 4/10**



### **PTOLEMAEUS CHAIN**

**Digital image by Howard Eskildsen - Ocala, Florida, USA**

**May 28, 2004 - 01:19 UT**

**10 inch f/16 Refractor - 2x Barlow - Nikon Coolpix 4300**

# **INTERNATIONAL BRIGHT LUNAR RAYS PROJECT**

## **RECENT OSERVATIONS**



**April 4, 2004 - 05:00 UT**



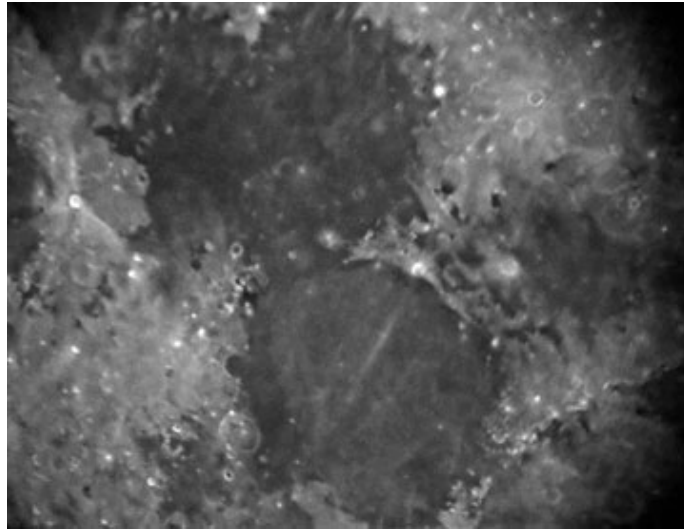
**September 2, 2004 - 02:45 UT**

**Both above digital images by Alexander Vandenbohede - Gent, Belgium  
20cm f/6 Dobsonian - Webcam in prime focus**

### **OBSERVING NOTES:**

Both imges are of Proclus very close to the evening terminator. The ray crossing Mare Serenitatis is also visible. I found it interesting to see that the part of the Proclus blanket, north of Palus Somni, stays relatively bright even when very close to the terminator. This is not the case for the southern part. Even so, the ray is lineated very well on the Palus Somni side. Northward it fades away gradually.

## **RECENT RAY OBSERVATIONS**

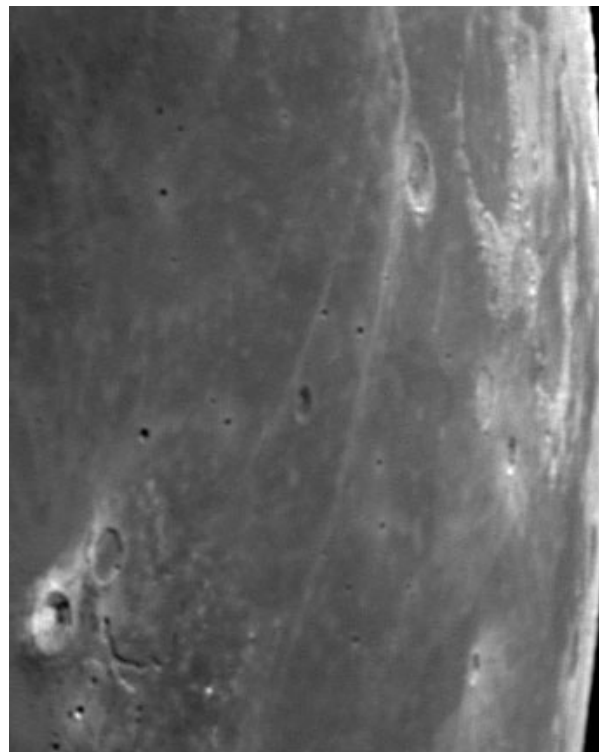


### **RAYS & BRIGHT SPOTS**

### **MARE SERENITATIS & MARE TRANQUILITATIS**

**Digital image by Raffaello Lena - Rome, Italy**

**August 24, 2004 - 10cm f/15 Refractor**



### **RAYS IN REGION OF SELEUCUS**

**Digital image by K.C. Pau - Hong Kong, China**

**October 7, 2004 - 21:56 & 21:58 UT (2-imge mosaic)**

**212mm Newt-Cass - Philips Toucam Pro**

# TRANSIENT LUNAR PHENOMENA

Coordinator – Dr. Anthony Cook – [acc@cs.nott.ac.uk](mailto:acc@cs.nott.ac.uk)

Assistant Coordinator – David O. Darling – [DOD121252@AOL.COM](mailto:DOD121252@AOL.COM)

Observations for September have been received from: myself, Michael Amato (USA), Richard Bossman (Netherlands), Marie Cook (UK), Robin Gray (USA), Raffaello Lena (GLR, Italy), Martin Mobberley (UK), Gerald North (UK), Brendan Shaw (UK), and Robert Spellman (USA). There have been some excellent examples of high resolution CCD images submitted, for example Martin Mobberley has sent me images at an image scale of 0.12"/pixel or ~250 m/pixel on the lunar surface. This is only 2.5x worse than the Clementine spacecraft imagery from 1994! However it is important to remember that in practice true resolution (as opposed to image scale) is closer to ~1 km. One needs to sample at higher spatial frequencies ( $> 2x$ ) in order to reconstruct near-diffraction limited views of the surface from stacked images.

A couple of months ago I requested observations of spurious color on lunar features in order to see if, occasionally this occurs in other directions to the expected vertical (normal) to the local horizon. Lawrence Fitton suggested, in the 1970's, that spectral dispersion might occur in other directions when an atmospheric pressure system moves across the observing site and this could explain some colored LTP. Gerald North, myself and Marie Cook submitted observations of spurious color. As far as I can tell all seems to be normal. For example on 2004 Sep 05 UT 21:26 I observed that the S-N line of the Moon was ~20 deg clockwise rotated with respect to the local vertical. Through the telescope I saw red on the inner NW rim of Plato - between the rim and the dark floor. These colors maintained their positions despite rotating the eyepiece in the Newtonian telescope. In our atmosphere blue is refracted more than red and at an altitude of 20.5 deg the differential spectral dispersion, from red to blue wavelengths, amounts to just under 2". A quick simulation in Adobe Photoshop software revealed that the spurious color in Plato was about in the right place, though should have been more NNW than NW - however this can probably be accounted for when one considers the locations of the most contrasty part of the rim against the dark floor.

During September your observations have helped to provide information for the analysis of several past LTP events. On 2004 Sep 04 Brendan Shaw imaged Plato about 40 min before the predicted time for a repeat illumination for Gruithuisen's 1825 Apr 08. Past catalogs give this as a LTP because: "the west part of the crater was brighter than the east part". Brendan's image confirms that indeed the western half of the floor is brighter than the eastern half at this stage in illumination! On 2004 Sep 23 Robin Gray observed Pico B and found that it vanished in a blue Wratten 38A filter, but was just visible through a red Wratten 25 filter. A colored filter blink was seen Sartory back in 1966 Sep 23 under similar illumination. Possibly this is a contrast effect? - in blue light there is more scattered light and this reduces visibility of faint features, more so than in red. Finally on Sep 25 I observed Mt Pico under the same illumination as did Findlay in 1976 Mar 12 when he reported "a ray seen extended from mountain in the SW (IAU?) direction - likened to a hockey stick". I saw the same "hockey stick" shaped formation, but regard it as part of the mountain, and not a ray.

Although ALPO has an impact flash group I would like to mention to BAA members, who read this article, that reports from Japan during the 2004 Perseids have confirmed (as far as I am aware) the first impact flash seen during the Perseids that has been positively confirmed. Furthermore it is the faintest flash ever recorded at around magnitude 9. Please do support Brian Cudnik of ALPO in observing impact flashes - these used to be regarded as LTP but are now observed by professional and amateur astronomers alike. I have included Earthshine observing times for different geographical sites around the world on the LTP prediction web site for those who are interested. Certainly during the



forthcoming Oct 28<sup>th</sup> lunar eclipse, apart from routine eclipse timings and searching for short term brightenings of features deep inside the umbral shadow, you should also be looking out for faint impact flashes and timing these to the nearest second.

For future predictions, including the more numerous illumination only events, these can be found on the following web site: <http://www.lpl.arizona.edu/~rhill/alpo/lunarstuff/ltp.html>. For members who do not have access to the internet, please drop me a line and I will post predictions to you. If you would like to join the LTP telephone alert team, please let me know your phone No. and how late you wish to be contacted. If in the unlikely event you see a LTP, 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!

Dr Anthony Cook, School of Computer Science & IT, Nottingham University, Jubilee Campus, Wollaton Road, Nottingham, NG6 1BB, UNITED KINGDOM. Email: [acc@cs.nott.ac.uk](mailto:acc@cs.nott.ac.uk)

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