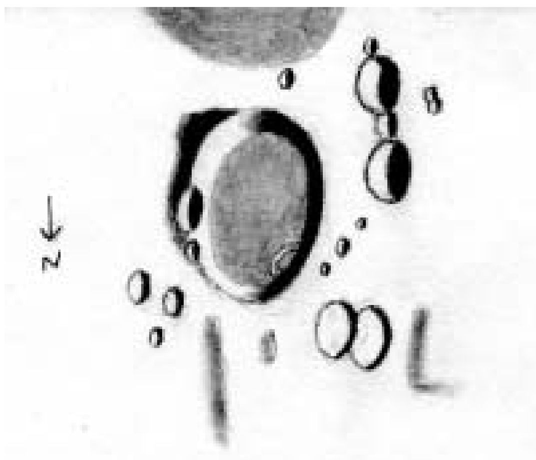
ASSOCIATION OF LUNAR & PLANETARY OBSERVERS
ALPO
Founded in 1947

THE LUNAR OBSERVER

RECENT BACK ISSUES: http://www.zone-vx.com/tlo_back.html

A PUBLICATION OF THE LUNAR SECTION OF THE A.L.P.O.
EDITED BY: William M. Dembowski, F.R.A.S. - dembowski@zone-vx.com
Elton Moonshine Observatory - http://www.zone-vx.com
219 Old Bedford Pike (Elton) - Windber, PA 15963

FEATURE OF THE MONTH - NOV. 2005



APOLLONIUS

Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA
August 21, 2005 - 06:24 to 06:50 UT
15cm Newtonian - 170x - Seeing 6-7/10

I drew this crater on the night of Aug. 20/21, 2005. This feature is fairly near the eastern limb, but longitude libration was favorable that night. This is a fairly large crater with a dark interior. It has the same tint as Mare Fecunditatis just to the south, though its rim is unbroken. (Several other craters in the area have similarly dark interiors.) The interior of Apollonius is featureless except for a narrow, curved strip of light inside its northwest rim that looks like a partial ring. Two craters are perched on its east rim: these are Apollonius E and M, E being the larger one. There is extensive shadowing south of E indicating a high southeast rim of Apollonius. Three craters are near the northeast rim of Apollonius. The Lunar Quadrant Map shows one as Apollonius Y, but it doesn't plot the other two. Apollonius F and P are the two relatively large craters to the northwest. Three small pits are just west of Apollonius: the largest one (in the middle) is Apollonius U on the LQ map. A chain of four craters is southwest of Apollonius with Apollonius D at the north end and Apollonius H being the other large one. Just west of Apollonius H is an elongated pit. This might be a double crater. I can't be sure of its identification from the LQ map. The small, crisp pit south of Apollonius is shown, but not labelled on the map. The dark area to the south is a tongue of Mare Fecunditatis as it approaches but does not reach Apollonius.

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.

FOCUS ON: Gassendi

William M. Dembowski, FRAS
Coordinator, Lunar Topographical Studies

On the northern shore of Mare Humorum is Gassendi, one of the Moon's most prominent and beautiful craters. Gassendi has a diameter of 110 km (68 miles) with walls that rise to a height of 1,800 meters (6,000 ft.). The walls are relatively intact except in the extreme south where the wall has been breached. This gap is where the mare material entered to cover the crater floor. In fact, so much mare material flooded the crater that the northern end is now 600 meters (2,000 ft.) higher than the exterior surroundings. This flooding apparently took place in at least two stages as can be seen by the differences in color and texture of the crater floor. Note the crescent shaped area in southern Gassendi (Figure 1).

Figure 1

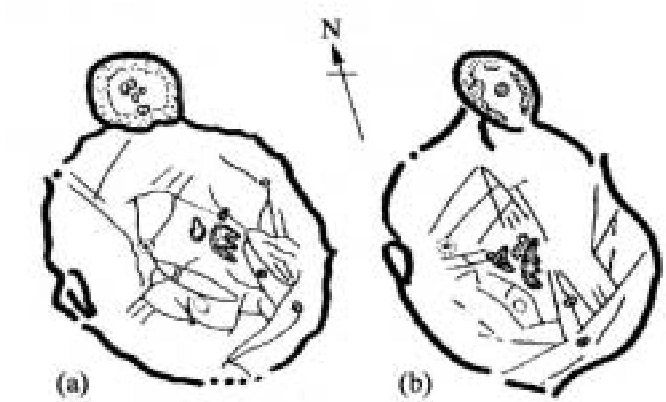
Digital image by Jeff Barton
Dallas, Texas, USA
June 19, 2005 - 06:43:45 UT
6 inch f/8 APO Refractor
4x Barlow - Philips Toucam Pro

What makes Gassendi so fascinating is the wealth of detail on its floor. Gassendi is criss-crossed by numerous rilles; Wilkins and Moore recorded 38 but the number you see will depend upon the size of your telescope and the angle of the lighting. So varied are the views of Gassendi that it is often said that "Each man sees his own Gassendi". Figure 2 shows sketches by two of the Moon's more famous observers and illustrates the "changing" appearance of the crater floor.

Figure 2

(a) - Edmund Neison
(b) - Phillip Fauth

From "Moon Observer's Handbook" by Fred W. Price



This is not to suggest, however, that observations of Gassendi's floor will always vary. Note the striking similarities in sketches made by TLO contributors two years apart (Figures 3 & 4).

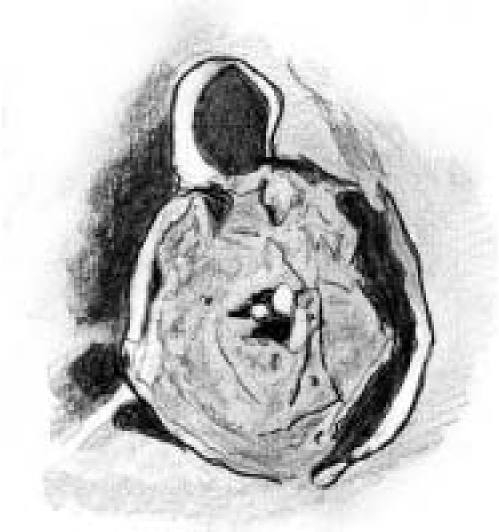


Figure 3

Sketch by Robert Wlodarczyk
Czestochowa, Poland
April 12, 2003 - 20:00 UT
18cm Newtonian - 192x

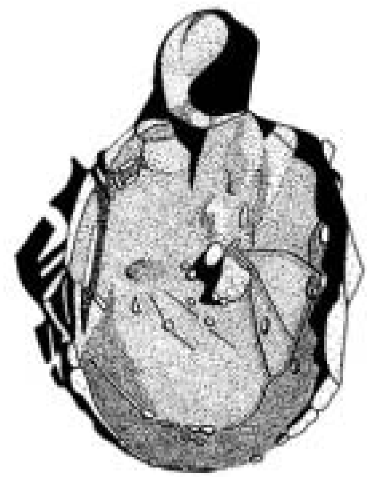


Figure 4

Sketch by
Alexander Vandenbohede
Ghent, Belgium
April 23, 2005 - 19:45 UT
20cm Newtonian - 191x

Dominating the floor of Gassendi is a central mountain complex comprised of three major peaks (Figure 5), the highest of which is 1,200 meters (4,000 ft.).

Figure 5

Digital image by Howard Eskildsen
Ocala, Florida, USA
July 31, 2005 - 10:28 UT
8 inch f/8 Refractor
Afocal with 9mm Plossl eyepiece
Nikon Coolpix 4300 camera

This peak is shown in stark contrast in Figure 6, a fine example of why observations should be made at other than the "usual" time. Another example of "unusual" lighting is an observation made after Full Moon (Figure 7).

Figure 6

Halifax, Nova Scotia, Canada
April 19, 2005
105mm f/10 Refractor
12x EP - Centrios Digital Camera

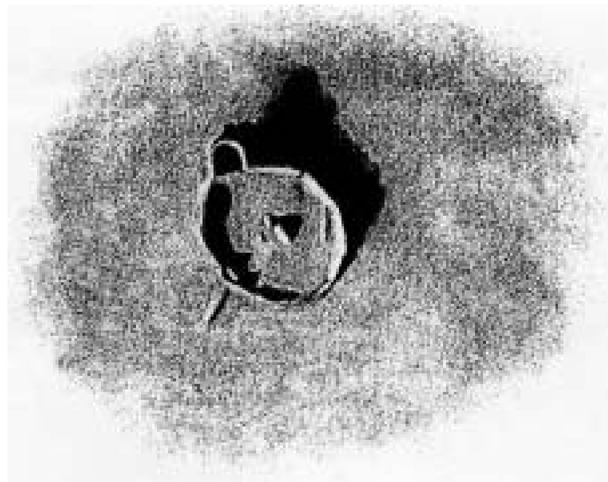


Figure 7

Sketch by Clyde Simpson
Cleveland Museum of Natural History
November 16, 1987 - 11:53 to 12:24 UT
Colong: 216.46 - Lunar age: 24.8 days
10-1/2 inch Refractor - 14mm EP

In addition to its myriad of topographical features, Gassendi is of particular interest to students of lunar transient phenomena. On April 30, 1966 a red event in Gassendi was witnessed by several independent observers including Patrick Moore who wrote: "This was, in fact, the most unmistakable red event that I have ever seen on the Moon, and it persisted for about four hours. The main feature was a wedge-shaped, reddish-orange streak extending from the wall of Gassendi right across to the central peak."

REFERENCES:

Moore, Patrick – "New Guide to the Moon", W.W. Norton & Co., 1976
North, Gerald - "Observing the Moon: The Modern Astronomer's Guide", Cambridge Univ. Press, 2000
Price, Fred W. - "The Moon Observer's Handbook", Cambridge University Press, 1988
Wlasuk, Peter T. - "Observing the Moon", Springer-Verlag, 2000

CALL FOR OBSERVATIONS - FOCUS ON: MARE NECTARIS

Thanks to all who contributed to this installment of *Focus On*. The subject for the January 2006 edition will be Mare Nectaris and will include its bordering craters Fracastorius and Dauguerre. Observations need not be recent so search your files or add this area to your observing list. Please send your observations to William Dembowski at one of the addresses shown on Page one.

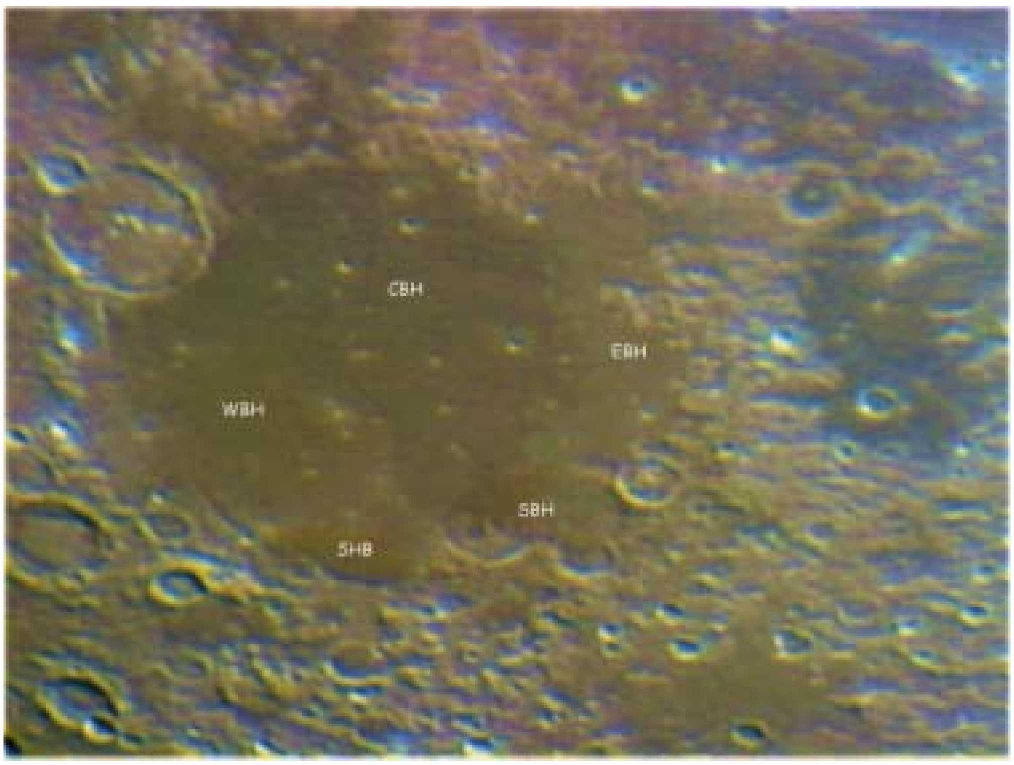
Deadline for inclusion in the Mare Nectaris article is Dec. 20, 2005.

COLOR STUDY OF GASSENDI & MARE HUMORUM

Alexander Vandenbohede - Ghent, Belgium

EDITOR:

Alexander Vandenbohede has been experimenting with color analysis of the lunar landscape and submitted the following as part of the ***Focus On*** project for Gassendi. Note that his conclusions on the source of flooding in Gassendi do not agree with those in the classic and current literature used to compile the main body of the ***Focus On*** article. Such observation-based conclusions are a fine example of science in action …. science at its best.



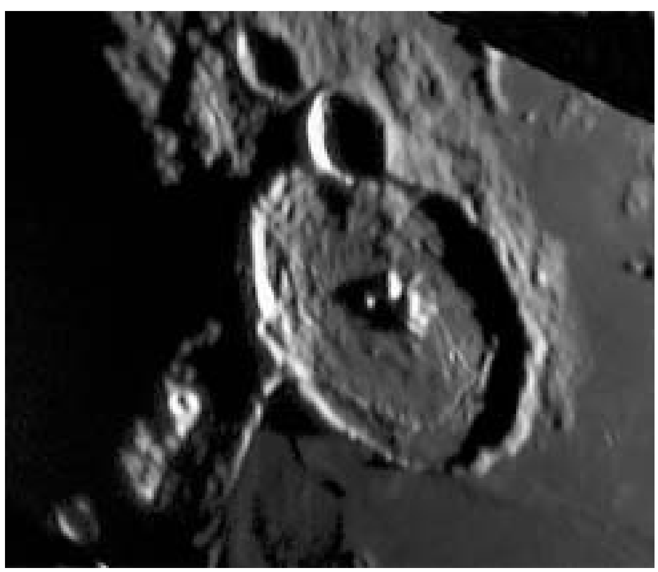
Gassendi and Mare Humorum
April 21, 2005 - 20:00 UT
20cm f/6 Newtonian & Webcam

NOTES BY THE AUTHOR:

The saturation of the image is enhanced to see the colours. In this way, different lithological units are visible in Mare Humorum (East Humorum Basalts, EHB; Central Humorum Basalts, CHB; West Humorum Basalts, WHB; South Humorum Basalts, SHB). CHB has a larger titanium oxide content than the EHB. WHB is almost identical than the EHB. SHBs are presumably pyroclastic deposits. The image also shows that the interior of Gassendi has a different colour than the Humorum basalts (a small area along the southern part of Gassendi is perhaps an exception) indicating that these are different deposits. It illustrates that no lava from Humorum has flown in Gassendi's interior and flooded it. It must have come from within Gassendi itself.

MORE GASSENDI IMAGES

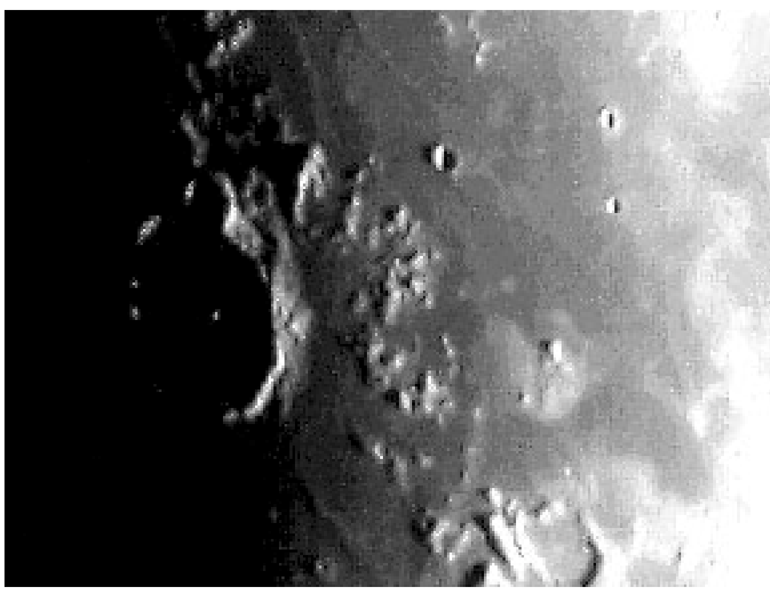
Digital image by Raffaello Lena - Rome, Italy
13cm f/6 Refractor - Webcam



Digital image by Ed Crandall - Winston-Salem, North Carolina, USA
October 14, 2005 - 01:21 UT
10 inch f/7 Newtonian - 2x Barlow - Philips Toucam

MORE GASSENDI IMAGES

Digital image by Diana Todd - Redcar, Cleveland, England
March 14, 2003
8 inch SCT - SAC-7 Camera



Digital image by Daniel del Valle - Aguadilla, Puerto Rico
September 6, 2003 - 08:08 pm ADT
8 inch SCT - Logitech QuickCam

LUNAR TOPOGRAPHICAL STUDIES

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

OBSERVATIONS RECEIVED

JEFF BARTON - GARLAND, TEXAS, USA
Digital images of 23-day Moon, Sinus Iridum to Plato, Copernicus

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

DANIEL DEL VALLE - AGUADILLA, PUERTO RICO
Digital images of Gassendi (4)

HOWARD ESKILDSEN - OCALA, FLORIDA, USA
Digital images of Hyginus (3), Triesnecker Rilles, Hadley Rille (2), Imbrium lava flow, 27.7-Day old Moon, Dopplemayer & Vitello, Alpine Valley, Plato, Delisle & Diophantus, Gassendi, Schickard & Wargentin & Nasmyth & Phocylides, Zucchius & Bettinus & Bailly, Lacroix, North of Sirsalis (2), Lohrmann & Hevelius & Cavalerius, Reiner & Reiner Gamma, Aristarchus, Hansteen & Billy, Mersenius, Scoresby to Peary, Philolaus, South, Gruithuisen gamma & delta, Flamsteed

PETER GREGO - REDNAL, BIRMINGHAM, ENGLAND
Electronic sketches of Full Moon, Gauss, Crozier, Mons Gruithuisen, Moretus (2)

ROBERT H. HAYS, JR. - WORTH, ILLINOIS, USA
Sketches of Apollinus, Bessel

RAFFAELLO LENA - ROME, ITALY
Digital images of Gassendi & Mare Humorum (2)

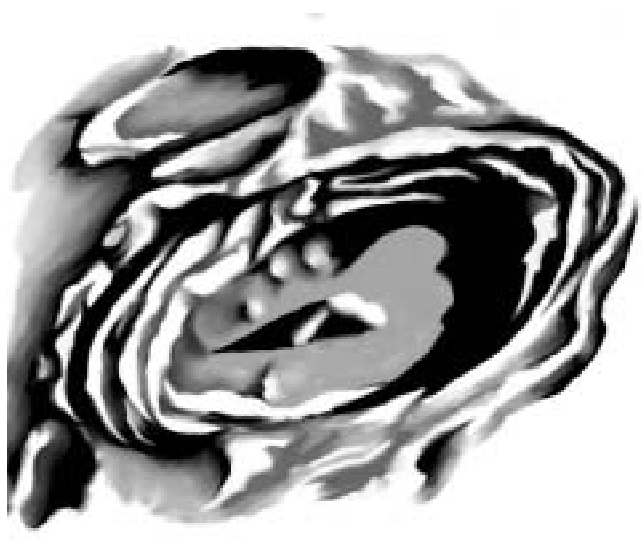
ANTONIO MARINO - ERCOLANO (NAPOLI) ITALY
Digital image of Aristarchus

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

RECENT TOPOGRAPHICAL OBSERVATIONS

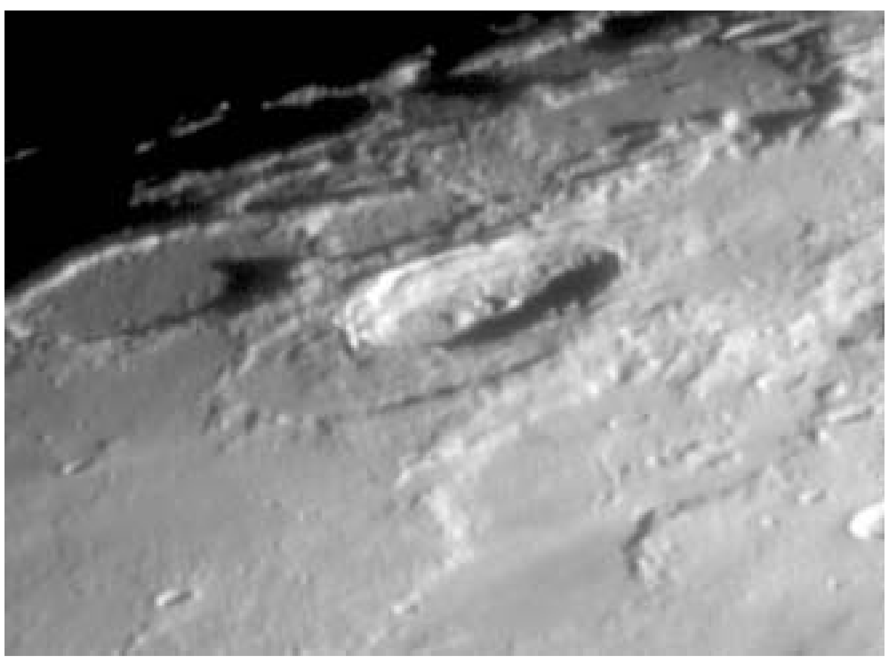
COPERNICUS
Digital image by Jeff Barton - Dallas, Texas, USA
September 26, 2005 - 11:20 UT
6 inch f/8 APO Refractor - 4x Barlow



MORETUS
Electronic (PDA) sketch by Peter Grego - Rednal, Birmingham, England
September 24, 2005 - 03:15 to 03:45 UT
8 inch SCT - 200x - Seeing AIII

RECENT TOPOGRAPHICAL OBSERVATIONS

ARIADAEUS
Digital image by Randy Tatum - Richmond, Virginia, USA
August 25, 2005
10 inch f/12 Newtonian - 2x Barlow - Philips Toucam Pro



PHILOLAUS
Digital image by Howard Eskildsen - Ocala, Florida, USA
October 16, 2005 - 00:28 UT
6 inch f/8 Refractor - 5x TeleXtender - NexImage Camera

RECENT TOPOGRAPHICAL OBSERVATIONS

ARISTARCHUS
Digital image by Antonio Marino - Ercolano (Napoli) Italy
August 27, 2005 - 04:10 UT
150mm Intes Micro - 2x Barlow - Philips Vesta

PYTHAGORAS
Digital image by Howard Eskildsen - Ocala, Florida, USA
October 16, 2005 - 01:25 UT
6 inch f/8 Refractor - 5x TeleXtender - NexImage Camera

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:

New Views of the Moon

Conference sponsored by:
Lunar and Planetary Institute & National Aeronautics and Space Administration
September 18-20, 1998 - Houston, Texas, USA

USE OF A GIS DATABASE OF BRIGHT LUNAR CRATERS IN DETERMINING CRATER CHRONOLOGIES.

J. A. Grier, A. McEwen, and R. Strom - LPL, University of Arizona

In order to ultimately determine the flux of impactors onto the lunar and the terrestrial surface in recent (~600 Ma) time, believable, absolute ages for a vast number of bright, rayed craters on the lunar surface are needed [1]. Ideally, *absolute* ages can be determined by obtaining samples from each crater, radiometrially dating them, and then extrapolating an impactor flux. Realistically, it is clear that only a small number of the larger lunar craters can and will be radiometrically dated. The smaller craters are also of interest, since they will reflect the bulk of any very recent impactor population. Thus, large numbers of dates cannot be generated solely by this method.

On the other hand, a large number of *relative* ages can conceivably be generated by examination of lunar spacecraft spectral data with near global coverage. The Clementine color data set provides global lunar coverage and appropriate spatial resolution to undertake such a survey. The Optical Maturity Parameter (OMAT) developed by Lucey and collegues [2,3] appears to be a possible tool for assisting in the determination of the relative ages of bright rayed craters, but the limitations and applicability of this tool for such a survey need to be determined. An extensive survey of bright rayed craters down to small sizes (1 km or less) will be conducted using the Clementine color data. A relative crater chronology will be generated using several tools, including superpositioning of rays, OMAT images, current age estimates for craters, current estimates for the rates of soil maturization, etc. The radiometric ages from known craters included in the survey will allow this relative chronology to be constrained absolutely, and a crater flux to be generated. Such an endeavor, if successfully carried out, would have far-reaching significance in understanding recent/future cratering on the Earth and Moon, and in the interpretation of cratered surfaces and crater chronologies.

Toward this end, initially, we conducted a survey of bright lunar craters in the 750 nm UVVIS, in order to take a preliminary look at the size-frequency distribution of bright craters down to very small sizes, and to explore possible biases such as phase angle and background terrain (4). Size frequency distributions generated for the Mare and Highlands were quite different at smaller sizes. Differences in the size-frequency distributions due to phase angle became statistically significant at latitudes greater than about 40º. We then considered the use of the specific 750–950 OMAT ratio developed by Lucey et al. as a possible tool for dealing with these and other issues.

We have examined test OMAT images with the purpose of discovering limitations and appropriate uses for the OMAT, and attempting to create a technique using OMAT images to conduct large scale survey of bright rayed lunar craters and generate a relative age chronology. Consistent with recent work [2] we see that OMAT images allow the very brightest, youngest craters to stand out. In several cases, it is easier to discern the existence and extent of bright rays/halos of craters in the OMAT images than the UVVIS. Also, we see that the OMAT images assist in normalizing the Mare/Highlands differences. Differences in the Mare and Highlands are clearly important in generating a self consistent database, since Mare/Highlands boundaries played a critical role in changing the apparent size-frequency distribution of craters in the 750 nm filter alone. However, differences in the physical properties of Mare and Highland soils and slopes also clearly need to be examined.

Craters with a wide range of apparent ages are characterized by a bright torus just inside the tip of the crater rim. Even craters that are morphologically quite degraded can possess this feature, which seems indicative of downslope movement in the interior of the crater wall. Measuring the OMAT of a crater is problematic since the value is different on the center, rim, and ejecta of the crater, albeit systematically [2]. Measurements of the insides of craters show that the interiors are apparently less mature than the ejecta. Lucey, et al. believe this may be due to GIS DATABASE OF BRIGHT LUNAR CRATERS: J. A. Grier, A. McEwen and R. Strom the presence of competent impact melt inhibiting maturization [2], but downslope movement and other factors may be critical [4]. Examining a larger number of very small craters may shed some light on this, as smaller craters will not have floors lined with competent impact melt, and will not be surrounded by melt halos.

A phase angle correction is clearly of great importance if the higher lunar latitudes are to be included in the survey. Phase angle biases will be dealt with by using phase angle backplanes to map rayed crater frequencies as a function of phase angle to show (and correct for) the bias in detecting bright rays at high phase. Additionally, work is now under way [5] to better normalize the average lunar color and albedo as a function of phase angle. This correction, while not improving detection of rays and halos at high phase angles, will remove seams in the OMAT images. Finally, separation of brightness variations due to albedo (intrinsic brightness of surface materials) from brightness variations due to topographic shading (most prominent at higher phase) [5] could result in much better OMAT images at high latitudes.

The apparent age of a crater, based on crater size-frequency distributions [4] and OMAT images [2] is dependent on the size of the crater. The ejecta of the crater Tycho appears to be less mature than that of South Ray crater, although South Ray is a younger crater [2] (Tycho is about 100× the size of South Ray). It may be that craters of a certain size can be given apparent relative ages to one another, and an independent means of correlating these size-dependent chronologies can be generated on the basis of maturization rates. Note that simple bowl-shaped craters of similar size have similar shapes, therefore the slope-dependent maturization processes will be similar from crater to crater within this morphology. It will therefore be meaningful to use OMAT values for crater interiors as a measure of relative age for craters in a particular size bin (such as 2–3 km).

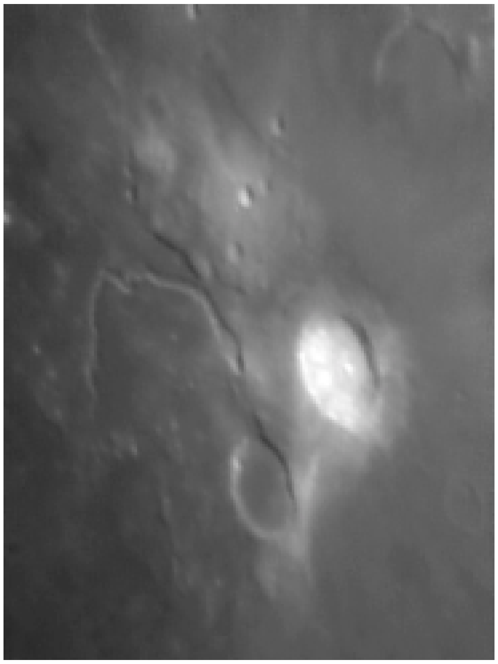
The GIS database we are generating including size, morphologic parameters, ray/halo descriptions, OMAT values etc. will help us constrain and quantifiy the complications and biases inherent in interpreting the lunar cratering record with the Clementine mosaics. This correlated with actual sample data should generate new insight concerning rayed/haloed craters and move towards a better understanding the recent crater chronology on the lunar surface.

References:

[1] McEwen A. et al. (1996) *JGR*.
[2] Lucey P. et al. (1998) *JGR*, in press.
[3] Lucey P. et al. (1998) *LPS XXIX*, Abstract #1356.
[4] Grier J. et al., (1998) *LPS XXIX* Abstract #1905.
[5] Eliason et al., (1998) Multispectral Mapping of the Moon by Clementine, this conference.

RECENT RAY OBSERVATIONS

REINER GAMMA
Digital image by Howard Eskildsen - Ocala, Florida, USA
October 16, 2005 - 01:31 UT
6 inch f/8 Refractor - 5x TeleXtender - NexImage Camera



ARISTARCHUS
Digital image by Howard Eskildsen - Ocala, Florida, USA
October 16, 2005 - 01:28 UT
6 inch f/8 Refractor - 5x TeleXtender - NexImage Camera

LUNAR TRANSIENT PHENOMENA

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

ALPO/BAA - LTP NEWSLETTER - NOVEMBER 2005

Dr. Anthony Cook - Coordinator

Observations for September have been received from: Jay Albert (Lake Worth, FL, USA), Michael Amato (West Haven, CT, USA), Michael Moschat (Halifax, NS, Canada), Clive Brook (Plymouth, UK), Marie Cook (Mundesley, UK), Tony Cook (Long Eaton, UK), Daniel del Valle Hernandez (Puerto Rico), Robin Gray (Winnemucca, NV, USA), Antonio Marino (Naples, Italy), Gerald North (Narborough, UK), and Brendan Shaw (UK). A total of 13.5 hours of coverage was obtained. Note that observing time quotes here, and in past articles, are provisional as often additional observations come to light after publication.

On Sep 12 at UT 00:40-01:02 Daniel del Valle Hernandez (Aguadilla, Puerto Rico) made a sketch (see Fig 1) of the Birt area and found that "*despite the cleft near the dome being visible, Rima Birt was not so clearly visible – whether this was due to an obscuration, or the hazy conditions is uncertain*". Personally I would go for the hazy conditions as an explanation, but if anybody else has an image of the area close to this time, please let me know.

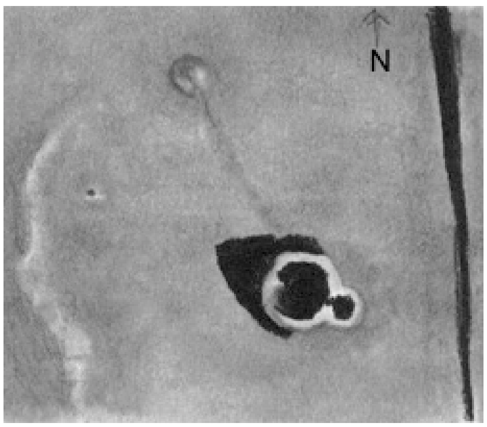


Fig 1. Birt through a 4.7" refractor x222, Orion V-block filter. Seeing 7/10 and transparency poor (hazy).

On Sep 20 Antonio Marino (Ercolano, Na, Italy) took a CCD image of the Messier A as this corresponded to the repeat illumination and libration (to within +/-1 deg) for Sir Patrrick Moore's LTP observation from 1951 Aug 20 UT 00:00? that the 1978 NASA catalog has the following description: *"Brilliant white circular patch seen in it. Has seen it and Messier blurred several times"*. The catalog gives this report a high reliability weight of 4, or meaning *"a single unconfirmed observation but from an experienced observer"*. Antonio's image does indeed show that the wall of Messier A quite bright, but we cannot tell if there is a bright circular patch there because the image has saturated slightly on the rim. To me it just looks like the rim is catching the sunlight and hence naturally bright. Anyway for European observers another repeat illumination and libration opportunity occurs on Nov 20-21 (see the predictions for further details).

Fig 2.Messier A (left crater) image taken at 20:37UT with a Philips Vesta camera with IR-cut through a x2 Barlow on a 150mm telescope. Video rate 10 frames per sec.

Finally, in Fig 3 is an image by Brendan Shaw that I thought I would use to pose a puzzle for our readers/observers. With the increasing use of CCD cameras to obtain higher and higher resolution, there is an increasing trend to use elaborate image processing techniques like image stacking and high pass filtering. Some of this can introduce artifacts, but sometimes it does definitely bring out detail that we would otherwise have not noticed. When Brendan sent me the image originally it did not show the multitude N-S striations seen in Fig 3. Brendan sends me his raw images (unsharpened) as all observers should! So I would be interested to hear from readers whether they think these N-S rilles (or tails to many of these secondary craters) are real? They occur in both the highlands on the West and in certain mare areas. There are also some diagonal striations in the highland area to the West too. Have any visual observers seen these before or are they image processing artifacts?

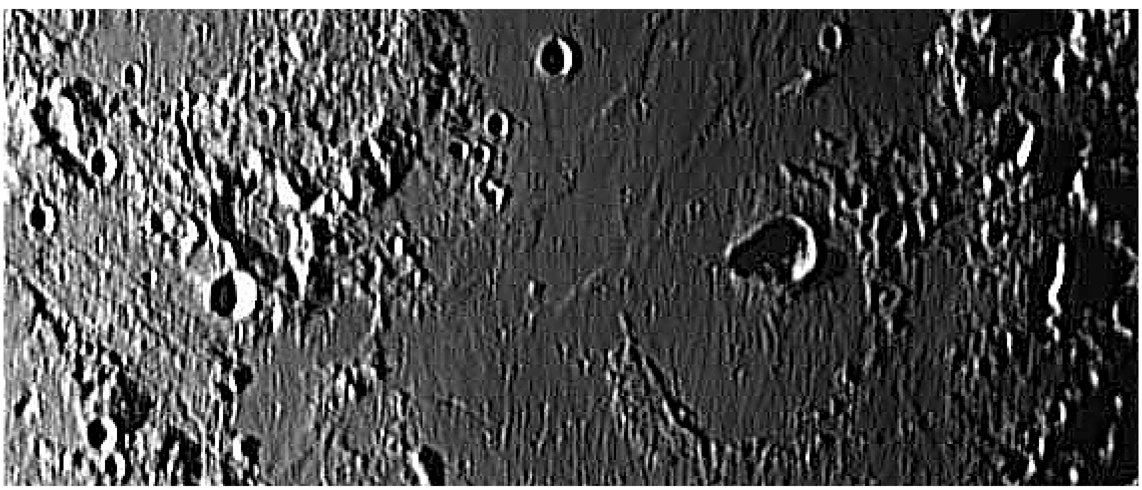


Fig 3 High pass filtered CCD image of Torricelli area 2005 Sep 23 UT 01:04 Near IR pass filter. The Sun's altitude was +4.4 deg above the horizon at Torricelli at the time that this image was taken.

Predictions, including the more numerous illumination only events, can be found on the following web site: **http://www.cs.nott.ac.uk/~acc/Lunar/tlp.htm** 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 TLP 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 TLP, 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

MOON MISSIONS - PAST & PRESENT

SMART-1 Images

Rima Hadley
http://smart.esa.int/science-e/www/object/index.cfm?fobjectid=37705

Glushko Crater
http://smart.esa.int/science-e/www/object/index.cfm?fobjectid=37704

Illumination of North Pole
http://smart.esa.int/science-e/www/object/index.cfm?fobjectid=36972

Cassini Crater
http://smart.esa.int/science-e/www/object/index.cfm?fobjectid=37790

Pythagorus Crater
http://smart.esa.int/science-e/www/object/index.cfm?fobjectid=36375

Craters Brianchon and Pascal
http://smart.esa.int/science-e/www/object/index.cfm?fobjectid=37791

Alpine Landscape on the Moon
http://www.esa.int/SPECIALS/SMART-1/SEMM7R7X9DE_0.html

A.L.P.O. LUNAR COORDINATORS

Julius L. Benton, Jr. – Coordinator, Selected Areas Program
jlbaina@msn.com

Dr. Anthony Cook – Coordinator, Transient Lunar Phenomena
acc@cs.nott.ac.uk

Brian Cudnik – Coordinator, Lunar Meteoritic Impact Search
cudnik@sbcglobal.net

David O. Darling – Asst. Coordinator, Transient Lunar Phenomena
DOD121252@aol.com

William M. Dembowski – Acting Coordinator, Lunar Topographical Studies
Dembowski@zone-vx.com

Marvin W. Huddleston – Acting Coordinator, Lunar Dome Survey
kc5lei@comcast.net