THE LUNAR OBSERVER

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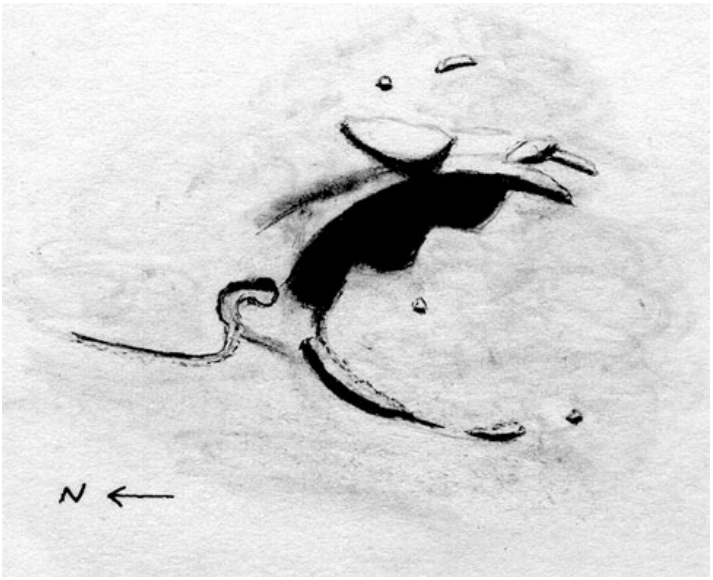
# FEATURE OF THE MONTH - APRIL 2005




## PRINZ

**Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA**
**October 25, 2004 - 3:00 to 3:26 UT**
**15cm Newtonian - 170x - Seeing 7-8/10**

I observed this feature on the evening of October 24/25, 2004, several hours before the moon hid 27 Piscium, and three nights before the lunar eclipse. This half-crater is a short distance northeast of Aristarchus. Prinz has no southern rim and only a low, broken west rim. The east and north rims are substantial with two or three particularly high points. The interior is smooth except for a tiny peak north of center. This may have been a substantial mountain that wasn't quite covered by mare material.

Prinz alpha is the large peak on the east rim of Prinz; its shadow merges with interior shadow. Three smaller peaks are south and east of Prinz alpha. Some wrinkling is evident north of alpha. Prinz A is just north of Prinz, and a rille starts at that crater. This rille makes a double turn as it winds northward from Prinz. The Lunar Quadrant Map identifies this feature as Prinz I. (A nearby rille, Prinz II, was not noticed.)

# 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 (4), Menelaus (3), Proclus (5), Kepler (4), Aristarchus (3)

ED CRANDALL - WINSTON-SALEM, NORTH CAROLINA, USA
Digital images of Clavius & Moretus, Copernicus, Tycho, Kies, Walter, Archimedes, Arzachel, Maginus, Cassini, The Straight Wall

COLIN EBDON - COLCHESTER, ESSX, ENGLAND
Sketch of Western Environs to Wichmann

MIGUEL ANGEL CRESPO MIR & MANUEL LOU -
TORRICELLA DE VALMADRID, ZARAGOZA, SPAIN
Digital images of Messier, Mare Nectaris, Proclus, Menelaus

HOWARD ESKILDSEN - OCALA, FLORIDA, USA
Digital images of Eichstadt to Drygalski, Hevelius to Aristarchus, Sinus Iridum

PAOLO LAZZAROTTI - COMANO (MS), ITALY
Digital images of Atlas & Hercules, Burgius w/Rays, Plato

YENAL OGMEN - LEFKONIKO, CYPRUS
Ray map of Messier

RAFAEL BENAVIDES PALENCIA - POSADAS, CORDOBA, SPAIN
CCD images of Clavius, Dome near Hortensius, Manilius, Montes Apenninus, Plato, Copernicus, Bullialdus, Flamsteed G, Marius, Vallis Schroteri, Gassendi

K. C. PAU - HONG KONG, CHINA
Digital images of Mare Crisium, Kepler, Goldschmidt, Petavius, Mare Humorum

GERARDO SBARUFATTI - CASSELE LANDI (LODI), ITALY
Digital image of Atlas & Hercules

# DOMES IN MARE FOECUNDITATIS

**By Raffaello Braga (rafbraga@tin.it) – UAI Lunar Section**

Mare Fecunditatis is a shallow depression filled by Late Imbrian lavas whose age ranges from 3.75 to 3.4 b.y. The thickness of the flows – mostly of the low-Ti type – varies from few hundred meters to over 1000 m in the centre of the basin [1]. A complex system of arcuate ridges to the east and NW-SE oriented rilles to the west become evident when the terminator passes onto the shores of the mare. Dorsa Mawson, Dorsa Geikie and Rimae Goclenius are all well known features to every lunar observer, but the most striking characteristic of Mare Fecunditatis is probably the remarkable concentration of ghost craters formed on the shallow surface of the basin and then buried by the flows (see Rukl plate No. 48). A number of domes is also present in the mare but they are not easy to image as the mare is close to the lunar limb. The best opportunities occur when the Moon is about 17 to 18 days old but imaging about few days after new Moon at local sunrise is also possible (see for example the LPOD page of March 11, 2005 on www.lpod.org).

On the night of October 2, 2004, Gerardo Sbarufatti imaged the area ESE of the Messier pair (see Figure 1) where 5 dome-like features appear clustered around an unnamed ghost crater. By using the lunar orthographic coordinates I have determined their positions which are reported in Table 1. Of the five domes only #4 shows a surface detail as a summit depression about 2 km long which can be an eruptive vent. The other domes seem featureless (at least in this image) and in fact it is difficult to determine if they are true volcanic constructs or the surface manifestation of some buried reliefs. This is particularly true for the rather steep-sided dome #2 and for the subdued dome #5. Moreover dome #1 (which is mentioned in the ALPO catalogue under the entry 0.764/-0.029) is close to a ridge segment and could be genetically related to this structure. By calculating the Sun's altitude above each dome at the time of the image (1) and by noting the shadows length and appearance it is possible to say that all domes seem to have slopes of less than 5°, that is well within the upper limit for this class of lunar features, but domes #2 and #5 could be steeper as the terrain on which the shadow is cast is not flat. Dome #6 is a very broad mare swelling 20 km wide. As it lies in a region with many ghost rings it could also be a lava-filled crater instead of a true dome. It appears to have a very low "bulge" on its northern surface. In the ALPO lunar dome catalogue a large dome (40 km) is reported at 0.697/-0.075, maybe it is the same as #6 but my estimates of its size is half that given in the dome list. The surface details of this feature would need a more detailed investigation.

In Table 2 the dome's approximate dimensions (2) and the Sun's altitudes above them have been reported together with a tentative classification based on the scheme of Head and Gifford [2] (3). I am currently refining the reported data as well as dome descriptions based on other images of this area that I have collected recently in order to put them into the Westfall classification. Any other images or drawings of this area from TLO readers would be very much welcomed by the writer.

| DOME No. | Xi | Eta | Long. (°) | Lat. (°) |
|---|---|---|---|---|
| | | | | |
| 1 | 0.763 | -0.031 | 49.76 | -01.78 |
| 2 | 0.775 | -0.039 | 50.86 | -02.24 |
| 3 | 0.783 | -0.040 | 51.59 | -02.29 |
| 4 | 0.770 | -0.044 | 50.42 | -02.52 |
| 5 | 0.777 | -0.050 | 51.08 | -02.87 |
| 6 | 0.696 | -0.080 | 44.29 | -04.59 |

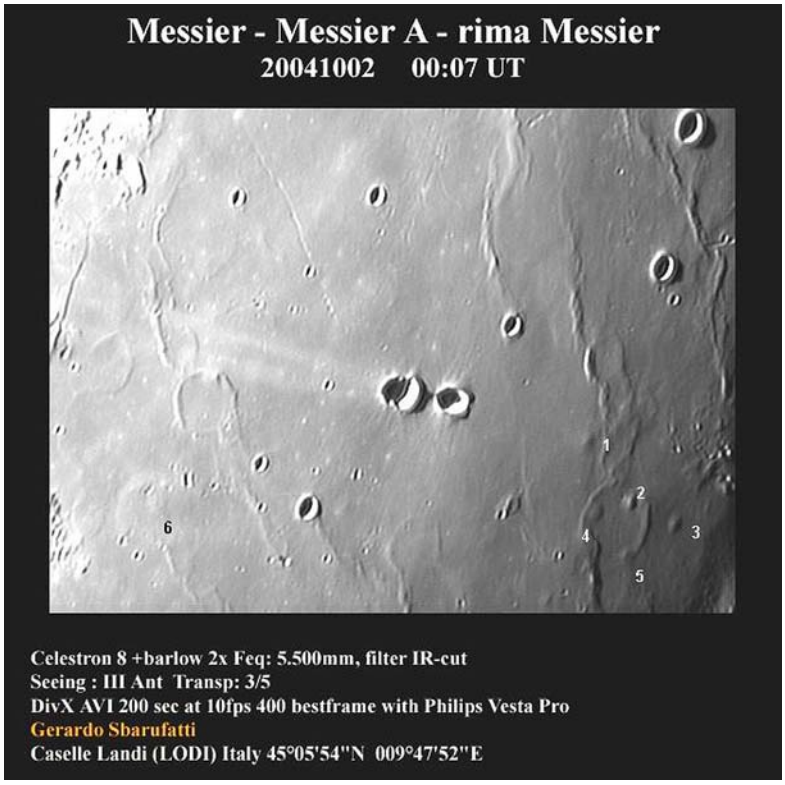
| DOME No. | Dimension (km) | Sun's altitude (°) | Class |
|---|---|---|---|
| | | at 20041002 – 00:07 UT | |
| 1 | 4.6 | 3.5 | III |
| 2 | 5.7 | 2.4 | VI ? |
| 3 | 6.3 | 1.6 | III |
| 4 | 5.7 | 2.8 | II |
| 5 | 5.0 | 2.1 | VI ? |
| 6 | 20 | - | II ? |

**NOTES:**

(1) I made use of the Lunar Observer's Tool Kit by Harry Jamieson.
(2) Calculated by comparison with nearby craters and rounded to the closest 100 m. Details of the calculation and errors will be reported in a paper I am preparing about this lunar region. I noted that the crater diameters reported in the literature and those obtained by direct measures on the photographic plates often disagree by a significant amount. This could be an important source of errors and a very interesting issue worthy of further investigation.
(3) The classification scheme [2] was developed based on a limited number of domes. None of the above reported features matches exactly the Head & Gifford categorization.

**REFERENCES:**

1. Rajmon D., Spudis P. (2000) Geology and stratigraphy of Mare Fecunditatis, LPSC XIII, abs. no. 1913
2. Head J.W., Gifford A. (1980) Lunar mare domes: classification and modes of origin, The Moon and the Planets, 22, 235-2358



# DARWIN AND THE INTERPRETATION OF LUNAR FEATURES AT THE TELESCOPE

**By Colin Ebdon - Colchester, Essex, England**
**B.A.A. Coordinator, Lunar Topographical Subsection**

**This article originally appeared in the Winter 2003 issue (Vol.13 No.2) of *The New Moon* and is reproduced here with permission of The British Astronomical Association.**

A useful overview of the observations of Darwin in the annals of the BAA is provided by Harold Hill in his *"Portfolio Of Lunar Drawings* " (1). It was first recorded as a lunar feature in its own right by the Selenographer Schmidt in his publication of a Lunar map and book in 1878.(2) Attention was drawn to what has now become its most celebrated distinguishing feature - a large rounded hill or dome - by R.Barker in a BAA Memoir in the 1930's.

As Harold Hill points out, there are several likely reasons why Darwin was overlooked by earlier Selenographers, in particular the fact that its Northern and Southern borders are ill-defined, within the context of a generally very complex area of the moon, and also the effects of foreshortening at this longitude. This means that the walls of neighbouring features present themselves in the form of longitudinal ridges, making it difficult to discern the true boundaries of features. The same effects probably account, subjective differences in interpretation aside, for the fact that drawings of Darwin by various observers have thrown up anomalies which have not entirely been resolved even now.

With regard to the interpretation of observations generally, I am prompted by an instructive scale drawing which Harold Hill copied to me some time ago,
showing the scale of lunar features compared to the British Isles, if it were to be viewed telescopically from the same distance as the Moon. The lack of familiar detail serves to vividly underscore the fact that our view of the Moon at the eyepiece, however detailed it may seem, in reality has a coarseness of resolution which belies appearances.

It must be remembered that, even on nights of fine seeing, the smallest features we observe are in reality very large objects and the eye and mind are of necessity smoothing out what is actually there, in effect making the overall view something of a caricature. This, coupled with the stark shadows and highlights, and the effects of foreshortening due to longitude and libration, can result in misleading impressions being formed.

Darwin is described in Rukl's Atlas (3) as a "disintegrated walled plain" some 130km in diameter. The term 'walled plain' is an oft-used but (as pointed out by Brendan Shaw) seemingly loose term, which conjures up an evocative if somewhat false image when applied to objects such as Darwin. "Disintegrated" suggests "ruined" in the sense of a feature which once had its own integrity but has now fallen apart. However, in this instance, the term "complex" might be considered more appropriate as Darwin seems to be an ancient lunar impact feature which has been modified and overlayed to a considerable extent by later events. It certainly presents a seriously scarred face in close up. Neither can Darwin be considered as a "Plain" in any meaningful sense as it is anything but the comparatively featureless expanse suggested by that word.

It is important to take these points into account when interpreting our Earth-bound view of lunar features, as it is all too easy to form a mistaken impression of what one is really looking at.

The drawings which follow do not finally resolve any of the specific topographical anomalies evident in the observations of those who went before us. However, they may be compared with the composite line drawings in Fig. 1 and Fig. 2 and the accompanying summary, in an attempt to at least distinguish clearly the main features which we may hope to see at the telescope. As always, in order to consolidate our knowledge, further observations are needed and readers are actively invited to take a look for themselves.

**The Boundaries Of Darwin**:

It must be remembered that the naming of the principal features on the visible lunar surface has been a largely Earth based pursuit, and we must not fall into the trap of believing that naming is being i.e the identification of a discrete area of the Moon as a feature to be observed, does not of itself mean that feature has a true geological identity .

In this instance, there seems to be just enough of a 'rim' to Darwin to enable us to mark it off as an impact feature in its own right, and enough evidence of later modification to make the assumption that it is a very old feature. Having said that, the area to the South where Darwin runs into Lamarck has indistinct boundaries.

In addition, there is a similarly shaped, if smaller and smoother, "plain" adjacent to the Darwin/Lamarck coupling, adjoining them immediately to the East and bisected by the Sirsalis rille. This feature has remained resolutely unnamed by Earthlings, yet might equally well be considered as distinct 'walled plain' having its own identity. It is not immediately obvious whether the Eastern rim of Darwin is what it seems, or whether it is in fact the Western rim of this unnamed feature. The situation is further complicated by the fact that, from Orbiter photographs, the well defined and dark floored crater Cruger itself seems to be sitting in the middle of a degraded lunar basin, the South West walls of which abut and coalesce with those of Darwin

**Principal Features:**

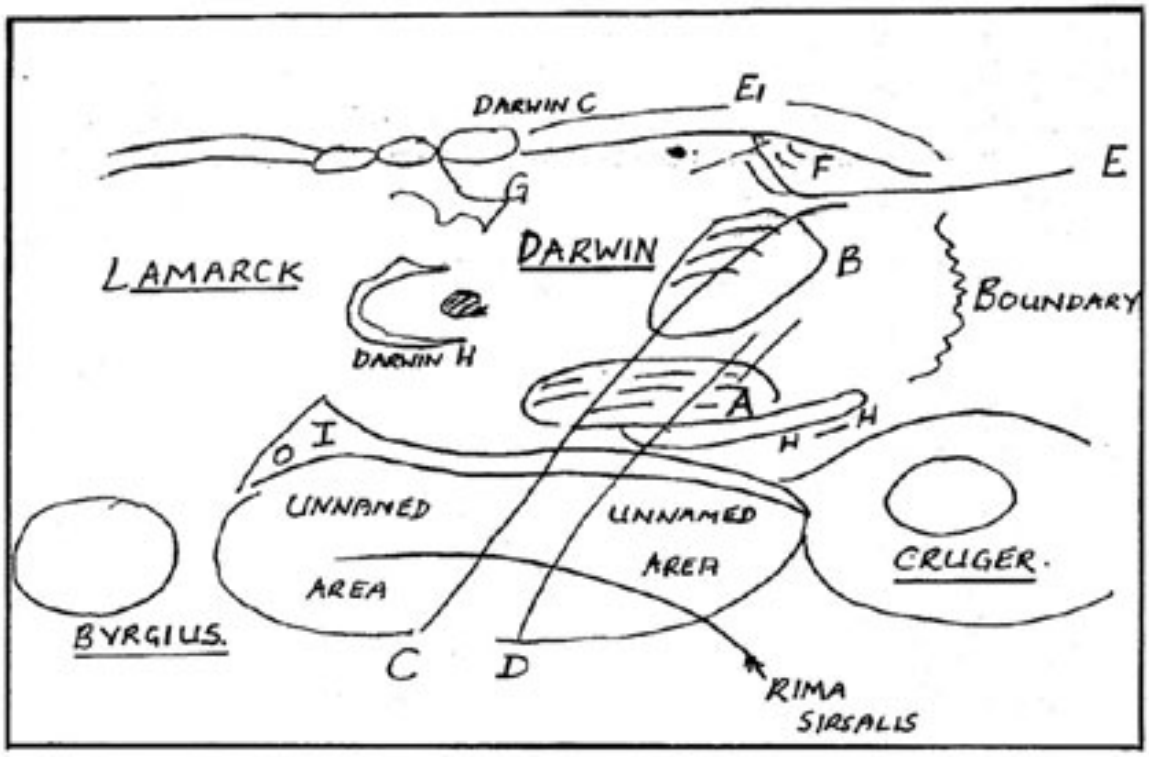
Reference is made here to the line drawings at Figure 1 and inset Figure 2.

As stated above, Darwin is best known for what has been described as 'the largest rounded hill on the Moon'. According to Moore it has also been recorded as a Dome, and was described more colourfully by R.Barker in 1932, on viewing it with his 12.5" reflector, as 'a huge cinder heap which bristled with roughness' (4). This latter description is pertinent because on most occasions, to most observers, the large rounded hill appears very smooth and dome-like in appearance and not at all rough.

In the relevant Lunar Orbiter frames, the 'dome' area does not stand out in great relief because of the high sun angle under which the photographs were taken and its true nature and extent are not that obvious. However, we can say that it is uneven in shape and appears to start with a shallow SE-NW slope around the middle of Darwin, rising steadily and then falling away fairly sharply on its North West slope. It does not immediately take the appearance of a classical lunar dome, but rather seems to be material which has heaped up in several layers or ridges, increasing in height to the North West. (Fig 2.) It could be that Barker was able to pick out this structure under fine seeing, although his description

# PRINCIPAL FEATURES OF DARWIN FROM LUNAR ORBITER FRAMES

## FIGURE 1





## KEY

| | |
|---|---|
| **A** | **Deep transverse ridges on raised area** |
| **B** | **Rounded hill or dome** |
| **C-D** | **Principal rilles** |
| **E-$E_1$** | **Transverse rille** |
| **F-G** | **Ridges** |
| **H-H** | **Extended ridge** |
| **I** | **Plateau** |

sounds as if he is talking about a much larger raised area of rough, transverse ridges just inside the East wall of Darwin.(see Fig. 1). Another possibility is that, under certain conditions of lighting, libration and poor seeing, both raised areas might gel into one object. It is also possible that the two areas could be confused one to another as both are emphasised to a greater or lesser extent depending on the precise conditions. It is certainly true that under certain angles of lighting this 'hill' seems very shallow indeed - and can appear more as just a slight "wave" on the floor of Darwin.

The second well known feature is the main extended rille (see Fig. 1) which (if it is continuous as supposed) commences at the Sirsalis rille far to the east of Darwin and continues right across the floor and 'domed' area of Darwin terminating just beyond it. Some observers have noted that the rille continues even further, but from the Orbiter photographs this effect seems to be due to a second rille at an acute angle to the first which sweeps past the main rille and on out of Darwin to the North. The effect of foreshortening at these longitudes accounts for the fact that the rilles seem to be joined; they do, in fact, almost touch.

There is also a shorter rille running parallel to the main rille, also commencing outside of Darwin, but terminating earlier than the first. Some observers - e.g the writer - have at times shown a crossing NE to SW rille, but this seems to be spurious. The Orbiter photographs show that Darwin in fact has several short secondary rilles, but these are unlikely to be visible in amateur telescopes.

Lastly, there are some fascinating effects at sunrise over Darwin, including an unexplained 'string of pearls effect' of points of light. This may be partly due to sunlight catching the edge of a sharp, steep ridge which runs Eastwards away from the outer edge of the crater adjacent to Darwin C, but more observations are needed to confirm this, and indeed the finer topographical details of the western sector of Darwin generally.

**References**

(1) Hill, Harold. *'A Portfolio Of Lunar Drawings'.* C.U.Press 1991

(2) Whitaker, Ewen.A. *'Mapping and Naming The Moon* '.C.U.Press 1999

(3) Rukl, Antonin. *Atlas Of The Moon.* Kalmbach Publishing 1996

(4) Moore , Patrick. *Lunar Domes.* Sky and Telescope. December 1958. Sky Publishing Corporation

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# Lunar Domes and Lunar Dome Maps: An Overview


## By Raffaello Lena and GLR group
## Revised dome list by Charles Kapral and Robert Garfinkle
## LAC dome maps by Brendan Show
## Digital Version by Piergiovanni Salimbeni and Fabio Lottero


The Geological Lunar Research (GLR) group has an ongoing project to discover and study lunar domes. Our activity has shown both the elusive nature of these lunar structures and the utility of CCD-image analysis in the elucidation of their character.

The original amateur lunar dome catalog was compiled by Harry Jamieson in the 1960s as part of a joint effort between the Association of Lunar and Planetary Observers (ALPO) and the British Astronomical Association (BAA). In 1992, Harry Jamieson and Jim Phillips (Jamieson & Phillips, 1992) published a revised lunar dome catalogue in the "Journal of the ALPO". The catalogue contained 713 domes and was the result of that joint effort.

In the years that followed its publication, digital imaging enhanced amateur capabilities and it became apparent that the dome catalog needed to be verified, corrected, and expanded. In 1997, the GLR formed an active team of observers (from several countries) and has studied several lunar domes. We have added new domes to the existing lists and are continuing to do so, providing geological information, dome measurements and dome classification by slope and height. Dome coordinates have been updated, with consistent measurements.

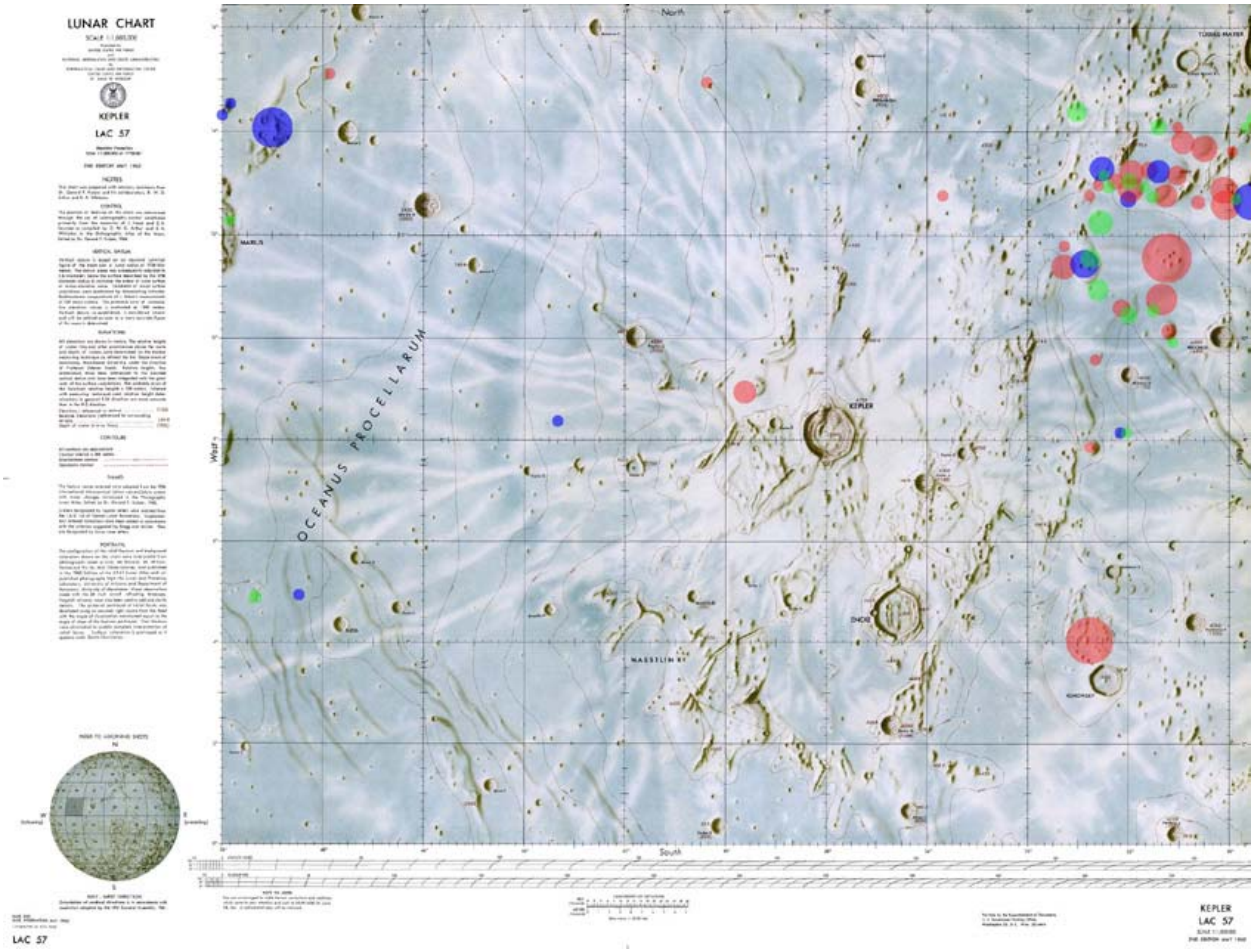
Several domes, studied by our group, have been included in a revised (unpublished) list by Robert A. Garfinkle, F.R.A.S. He has spent nearly 11 years revising, correcting, editing, and amending the 1992 ALPO catalogue.

Charles Kapral has recently compiled another revised list incorporating all domes listed in previous dome catalogues, other publications and those found by GLR research. Kapral's work also includes charts based on the Lunar Quadrant Maps (LQM) by D. W. G. Arthur and A.P. Agniery, (1964), "Lunar Designations and Positions, Quadrant I, II, III, IV". The LQM use the lunar Xi and Eta coordinates instead of lunar longitude and latitude. Kapral's maps and catalogue are on the Internet (digital version by Piergiovanni Salimbeni) in our website. Our current study of domes has been created facilitated by our own observations and CCD-images. Good quality data is regularly obtained by several active GLR observers and many works have been written in combined efforts such as: Jim Phillips, KC Pau, Cristian Fattinnanzi, Rodrigo Viegas, Piergiovanni Salimbeni, Christian Wohler, Maria Teresa Bregante.

Brendan Shaw has plotted the location of many domes on the Lunar Aeronautical Charts (LAC), so that other observers and dome researchers can easily check to see if a particular dome has been previously reported. The maps show filled circles at the locations of domes reported in two revised catalogues. Red circles are domes that appear in both the catalogues of Kapral and Garfinkle and whose positions agree within 0.1°. Green domes appear only in Kapral's revised catalogue and blue ones only in Garfinkle's catalogue. The digital version for the web was assured by Piergiovanni Salimbeni and Fabio Lottero (http://www.glrgroup.org/lac.htm). (See example on following page.)

On a final note I would like to thank all the authors and observers working for GLR - their enthusiasm, work, and results are a vivid indication of what a team of dedicated observers can accomplish.

# GLR Dome Map



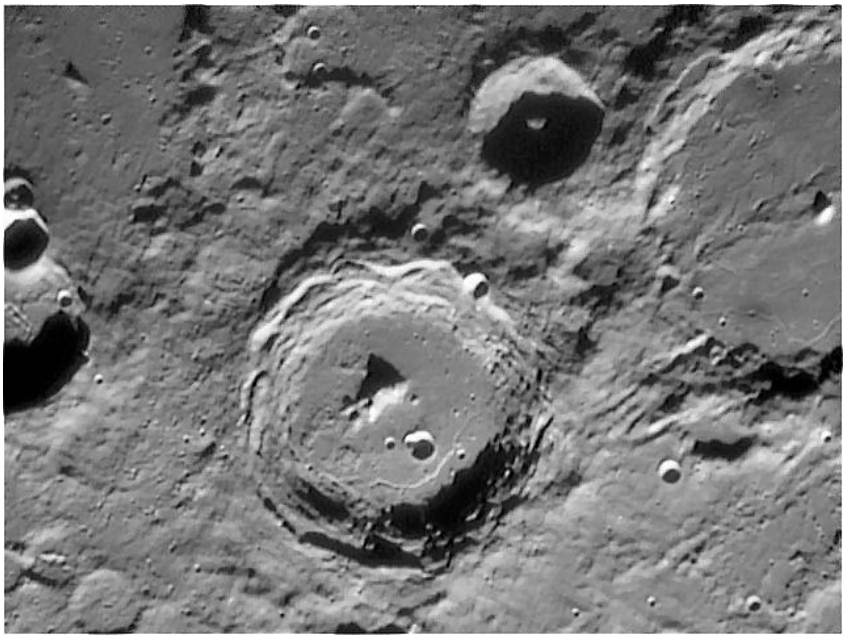

# RECENT TOPOGRAPHICAL OBSERVATION

## PETAVIUS

**Digital image by K.C. Pau - Hong Kong**
**February 12, 2005 - 11:20 UT**
**250mm f/6 Newtonian**
**Philips Toucam - 168 frames stacked**

# RECENT TOPOGRAPHICAL OBSERVATIONS

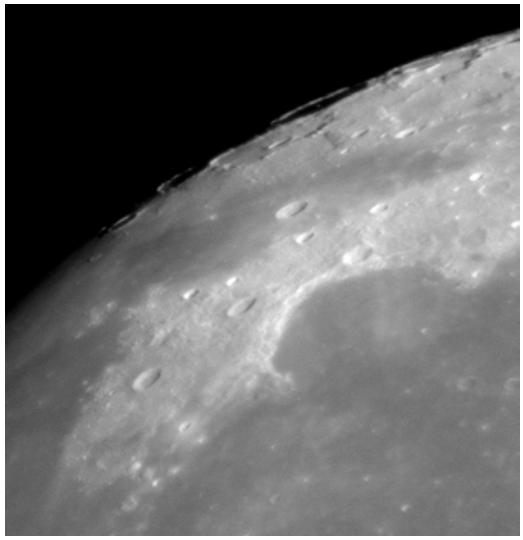
**ATLAS & HERCULES**
**Digital image by Gerardo Sbarufatti - Cassele Landi (LODI) Italy**
**October 1, 2004 - 23:12 UT**
**Celestron 8 inch SCT - 2x Barlow - Philips Vesta Pro**



**ARZACHEL**
**Digital image by Ed Crandall - Winston-Salem, North Carolina, USA**
**March 19, 2005 - 01:56 UT**
**10 inch f/7 Newtonian - 2x Barlow - Philips Toucam**

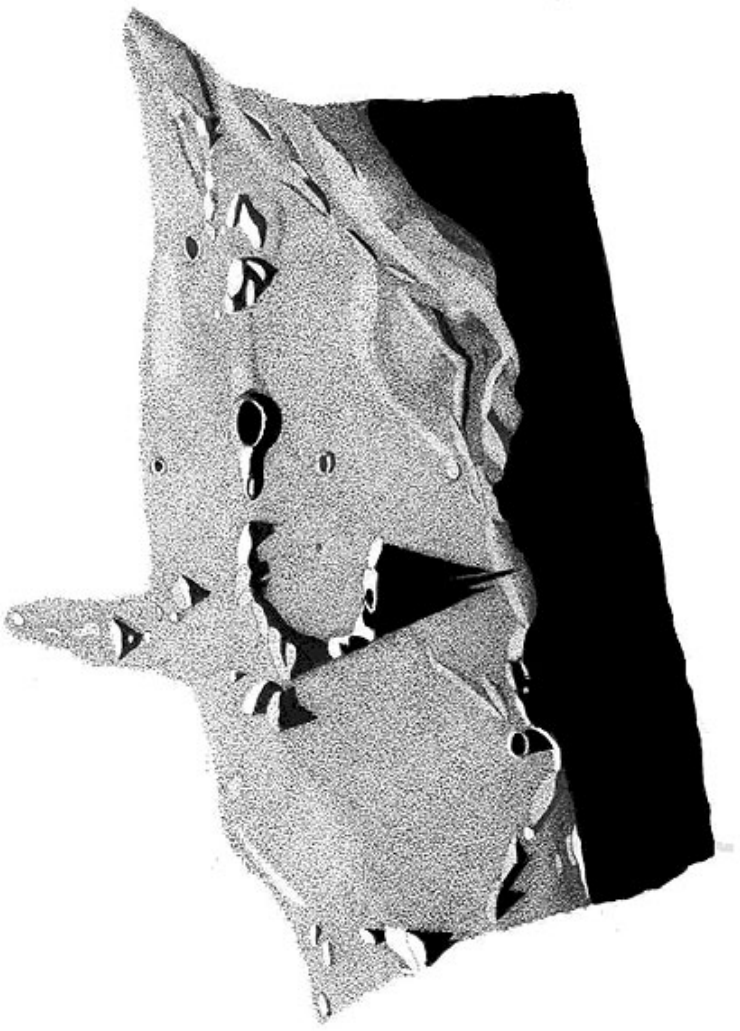
# RECENT TOPOGRAPHICAL OBSERVATIONS

**ARISTARCHUS & SCHROTER'S VALLEY**
**Digital image by Rafael Benavides Palencia - Posadas, Cordoba, Spain**
**February 20, 2005 - 22:47 UT**
**15cm Refractor - Philips Toucam Pro**



**SINUS IRIDUM**
**Digital image by Howard Eskildsen - Ocala, Florida, USA**
**February 22, 2005 - 02:32 UT**
**6 inch f/8 Refractor - Orion V-Block Filter - Nikon Coolpix 3400**

# RECENT TOPOGRAPHICAL OBSERVATION



## WESTERN ENVIRONS TO WICHMANN

**Sketch by Colin Ebdon - Colchester, Essex, England**
**February 19, 2005 - 21:45 to 23:15 UT**
**7 inch Maksutov-Cassegrain - 300x - Seeing AII to AIII**

**Observations submitted to the Topographical Studies Section 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**

# 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:

## "A New Photographic Atlas of the Moon"
## Zdenek Kopal - Taplinger Publishing Co. - 1971 (Page 42)

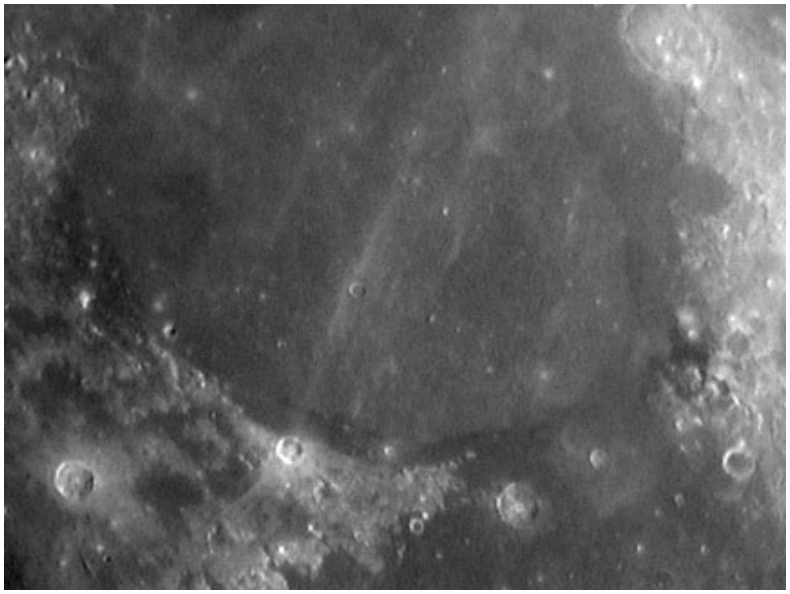
Lastly, several craters on the Moon - though not a very great number - are surrounded by systems of bright rays, resembling the ejecta patterns around terrestrial explosion craters. Bright rays associated with the craters Tycho, Copernicus, and Kepler represent perhaps the most conspicuous examples of such systems, but several other systems can be discerned elsewhere on the Moon as well. One of the most brilliant systems of bright rays has been photographed by the Apollo 8 mission over the Moon's far side emerging from the crater Giordano Bruno. Some, like those diverging from the crater Proclus on the western shores of Mare Crisium spread over only a little more than half a circumference; while others like Messier possess only two parallel rays reminiscent of a cometary tail.

Large ray systems are seldom characterized by complete symmetry and may (like Tycho's) include rays which do not intersect in the common focus. The most extensive lunar system of rays is that diverging from the crater Tycho; and some of its rays - like the one traversing Mare Serenitatis - exceed 2,00 km in length. The rays system associated with the crater Copernicus extends over 500 km from its center, but all other patterns of this type are smaller.

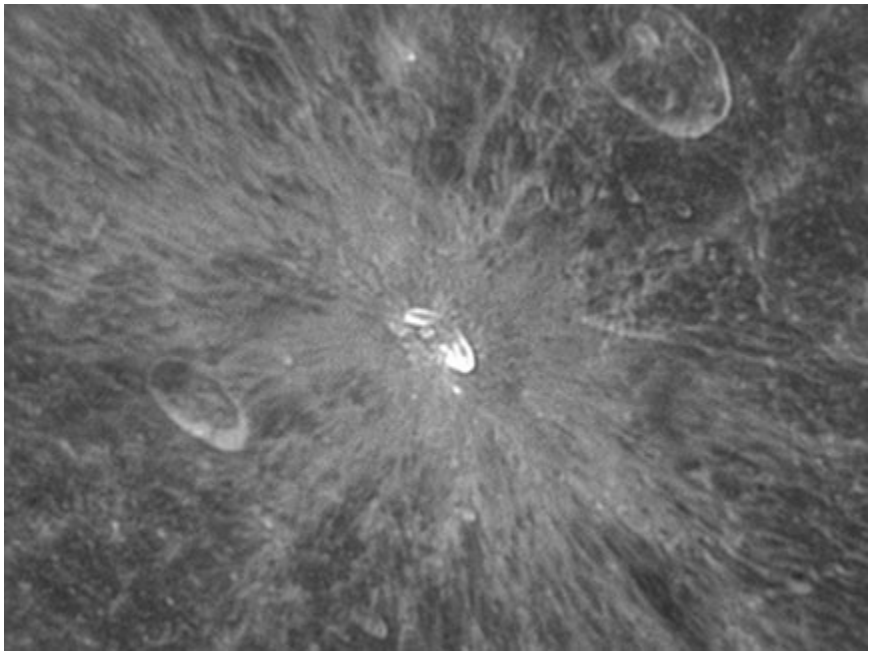
The rays accompanying lunar craters consist essentially of loop-shaped streaks of brighter material than that of the maria over which they have been splashed. By their reflectivity, the rays appear to be an extension of the crater rims and cannot be sharply distinguished from them. Moreover, their major arcs and loops can be often locally resolved into a system of feather-shaped elements, ranging from 15 to 20 km in length, radially spreading out from the crater.

The rays do not exhibit any measurable vertical relief (that is, they cast no shadows), and the variation of light reflected from their surface in the course of the lunar day suggests that even their microrelief is essentially the same as that of the surrounding darker landscape, from which they differ mainly by their relatively high albedo. They represent probably nothing more than thin layers of ejecta from an impact crater thrown out by the initial explosion, and deposited all around in ballistic trajectories.

# RECENT RAY OBSERVATIONS

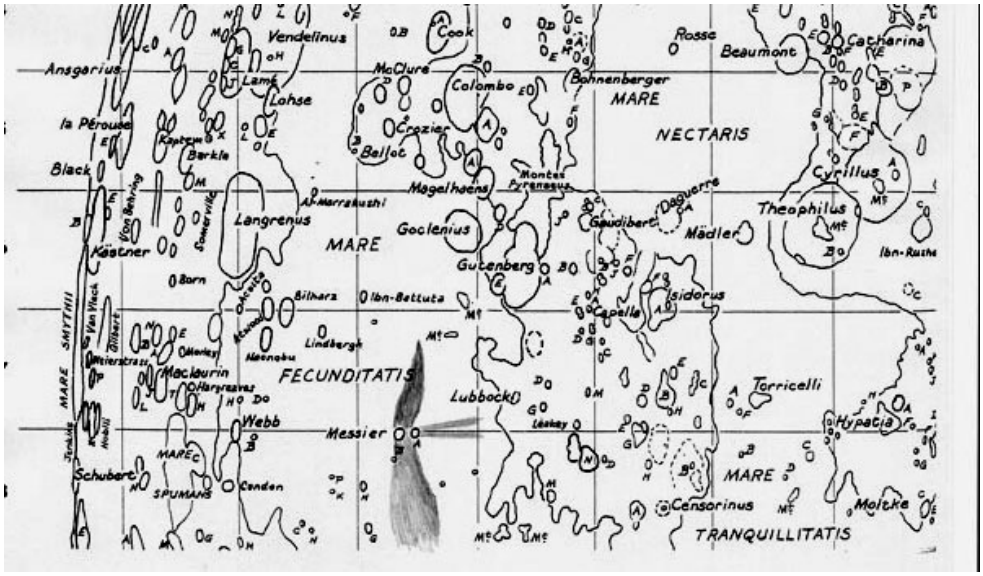


**MENELAUS**
**Digital image by Miguel Angel Crespo Mir & Manuel Lou**
**Torricella de Valmadrid, Zaragoza, Spain**
**December 21, 2004 - 21:14 UT**
**8 inch Celestron SCT - Philips Toucam Pro**



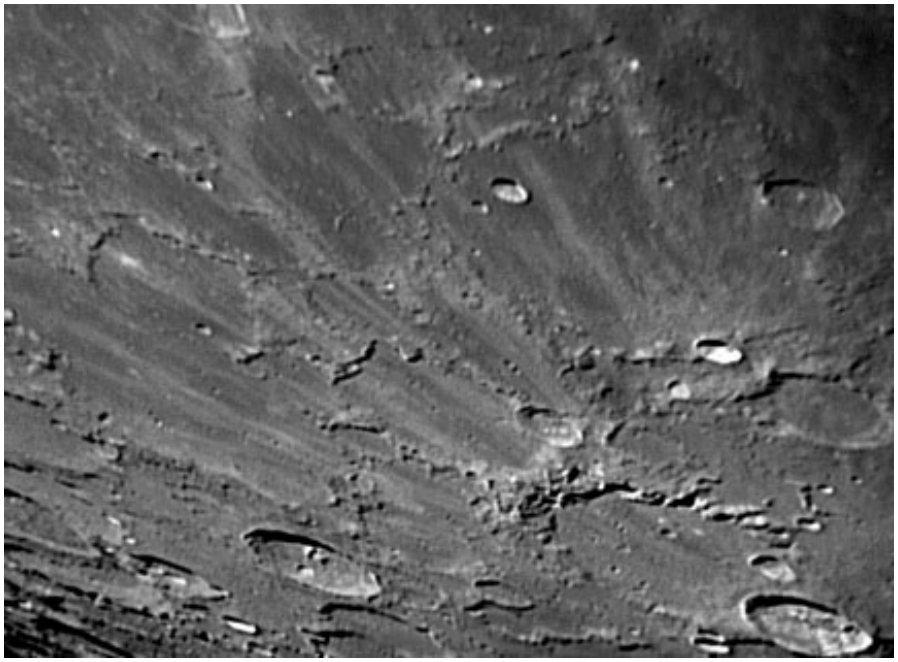
**BYRGIUS**
**Digital image by Paolo Lazzarotti - Massa, Italy**
**January 1, 2005 - 02:32 UT**
**250mm Planetary Newtonian - Lumenera LU075M Camera**

# RECENT RAY OBSERVATIONS




## MESSIER A

**RayMap by Yenal Ogmen - Lefkoniko, Cyprus**
**March 20, 2005 - 17:15 UT**
**Meade ETX125 - 146x**



## RAYS NEAR GOLDSCHMIDT

**Digital image by K.C. Pau - Hong Kong, China**
**September 26, 2004 - 14:26 UT**
**10 inch f/6 Newtonian - Philips Toucam Pro - 78 Frames stacked**

# LUNAR TRANSIENT PHENOMENA

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

## LTP NEWSLETTER - APRIL 2005

### DAVID O. DARLING - Assistant Coordinator

Observations for the month of February have been received from Jay Albert (USA) Michael Amato (USA), David O. Darling (USA), Robin Gray (USA), Don Spain (USA),

For this month fourteen days were covered giving us a 48.0% coverage for this lunation, these dates are 11, 13, 14, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, and 27.

During the observing period 27 lunar features were monitored this month. Those observed more than once are followed by the number of separate observations presented. Agrippa, Aristarchus = 2, Alphonsus, Arzachel, Baily, Bullialdus, Censorinus, Copernicus, Dionysius, Earthshine, Full Moon, Godin, Guericke, Herodotus, Kies, Konig, Mount Pico, Macrobius, Manilius, Mount Piton, Picard, Plato=2, Posidonius, Proclus = 2, Proclus D, and Tycho.

**Passing of a fellow observer Len Ritchey**

Len Ritchey passed away on peacefully at home with his family on February 11, 2005. He resided in Fort Myers, Florida, and was an active observer with the program. He participated in several alerts over the last year. His enthusiasm and zeal for the for the program will be sorely missed.

**Earth Shine Studies**

The Moon has many different aspects that it presents to the observer as it cycles through its phases. Most people are very familiar with the crescent Moon, first quarter and then the extremely enchanting Full Moon which has captivated the attention of man kinds through out their history. This can be seen in the naming of the different Full Moon's for each given month.

I find of all these different views of the Moon to be interesting to ponder and view but they do not captivate me like the shadow world of the Moon called the earthshine region. When one examines this region closely with a telescope you will find that your examining a world that is even more alien than what you experience with regular lunar observing. As you all know, the earthshine region of the Moon is illuminated not by direct sunlight but by light being reflected off the disk of the Earth.

I became interested in this region of the Moon on the evening of May 30, 1979, when the most eventful 7 minutes of my astronomical career took place. This single event was the primary catalyst that got me started on my quest to learn more about lunar transient phenomena. I had set up my 12.5 f5 Cave Newtonian reflector to observe the 3 day old crescent Moon. About 25 minutes after I began observing, I noticed a bright glowing patch in the earthshine portion of the Moon. It was located on the western limb of the disk and I found it was the crater Aristarchus. I first noticed the glowing patch at 02:50 U.T. it appeared electric arc blue in color and began to get brighter and brighter. It got so bright that the eyepiece I was using, a 25mm, was glowing blue and I could see a blue glow radiating out of the

eyepiece. At the brightest point of the event I looked at the Moon with my naked eye and could see the spot without any optical assistance. As the event continued, I called my wife Edna out to come quick and take a look, and by the time she got out to the telescope the event had diminished to only a fraction of what it was. The event only lasted 7 minutes and when it had disappeared, there was no hint that it had ever happened. Upon close examination of the earthshine region I could not find any hint of the glow or even find the crater Aristarchus.

Since this event I have spent many hours examining the earthshine region and documenting the intensity of the phenomena and the behavior of the bright craters such as Aristarchus, Tycho, Proclus, Menelaus, Manilius, and Copernicus. What I found was that many of these craters would shine brightly in the earthshine when the earthshine was bright. This was not the case with the crater Aristarchus which I witnessed on numerous occasions to shine brightly in the earthshine while the earthshine region was itself very opaque and low in albedo.

When I began my study of the Moon's earthshine it became apparent to me that I could give a standard value to its intensity of brightness, similar to what is used during the total eclipse of the Moon. I decided to establish a scale range from 0 to 5, with the darkest earthshine being 0 and the brightest being 5. My description for different levels of brightness was established after several years of reviewing my observing journals.

0: Earthshine region is very opaque with no features visible on the disk, even at the limb of the Moon. Nothing can be seen using binoculars or telescope.

1: Earthshine region is very opaque with no features visible on the disk, except along the limb of the Moon. Features such as Grimaldi and Mare Crisium can be detected but very little else can be seen.

2: Earthshine region is dusky in appearance and many of the darker Maria is visible. No bright craters, features, or rays are visible. The Moon disk stands out in the night sky and can be detected with the naked eye.

3: Earthshine region is bright with Maria plainly visible. Limb brightening may be visible. Bright craters like Aristarchus, Copernicus, and Kepler are visible.

4: Earthshine region intense with all lunar formations easily visible. The Maria is dark and defined on the lunar disk. The brighter craters stand out with great clarity. The ray structure is very evident. Earthshine can be easily observed with entire disk of Moon in eyepiece field of view. Glare from illuminated portion of Moon has no effect on the intensity of the earthshine. The earthshine stands out with great clarity to the night sky using the naked eye only.

5: Earthshine region extremely bright with craters like Aristarchus, Copernicus, and Tycho visible to the naked eye. Many small craters appear as star like points in the telescopic view. Low albedo features stand out with great clarity. There is no effort to seeing small details. Earthshine is very intense to the naked eye and no optical device is needed to see all formations.

When examining the earthshine region I also needed to establish what was happening with the crater Aristarchus and the earthshine region. Was the crater Aristarchus going up in brightness along with the earthshine or was it becoming bright independent of the earthshine intensity? The only way to determine what was going on was to document the earthshine region using CCD imaging and then taking brightness measurements of the earthshine and crater Aristarchus to see if both of these increased in brightness together. The other aspect of the program was to download from the web a satellite image of the side of the Earth that was directly under the sub-lunar point. This image would allow me to examine

the cloud cover of this side of the earth and the sub-lunar point to determine if variation in cloud intensity had any relationship on the earthshine intensity. The next thing involved using the program called Earth and Moon Viewer at: http://www.fourmilab.ch/earthview/vplanet.html This gives us the view of the Earth from the Moon so as to determine where the sub-lunar point is located. The internet site to access for the latest photograph of the Earth is the Space & Science Engineering Center at: http://www.ssec.wisc.edu/ .From there you click on images and data and then go to real time images and data and then click on western hemisphere. It is important that when you make your earthshine observation that part of your documentation should be the image for that day. I have been working on this program for 7 years now and only have a fraction of what needed to begin a good analysis. I want to invite you to become involved and begin your adventure by studying this mysterious and alien world we call the earthshine and help by contributing the observations needed verify that bright crater phenomena is a true L.T.P. event or just a product of earthshine brightness variations..

# MOON MISSIONS

## SMART-1 (European Space Agency)

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

Search of Apollo Sites: **http://www.space.com/missionlaunches/050304_moon_snoop.html**

Instrument Commissioning: **http://smart.esa.int/science-e/www/object/index.cfm?fobjectid=36801**

## Chandrayaan-1 (India)

Water Search: **http://www.space.com/missionlaunches/india_moon_050314.html**

ESA/India Cooperation: **http://www.esa.int/export/esaCP/SEMRXIRMD6E_index_0.html**

## Lunar-A (Japan)

Mission Overview: **http://nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=LUNAR-A**

## Selene (Japan

Mission Overview: **http://moon.nasda.go.jp/en/selene/index.html**