DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AND THE
USAF AERONAUTICAL CHART AND INFORMATION CENTER

GEOLOGIC ATLAS OF THE MOON
PTOLEMAEUS QUADRANGLE
I-566 (LAC-77; RLC-13)

NOTES ON BASE

The base (RLC 13) is one of a series of five Ranger IX charts compiled from television records of the six Ranger IX cameras. It covers the same area as LAC 77. The chart was produced in consultation with Dr. Gerard P. Kuiper and the staff of the Lunar and Planetary Laboratory, University of Arizona. ACIC production was supported by NASA Defense Purchase Request WO 5136. Photography and trajectory information was supplied by the Jet Propulsion Laboratory. Elevation data was compiled by the University of Manchester under Air Force Contract AF 61 (052)-829.

CONTROL

The lunar features on this chart are positioned to conform with the selenographic latitude and longitude coordinates based on selenocentric measurements made by ACIC and published in ACIC Technical Paper No. 15, "Coordinates of Lunar Features", March 1965. Supplementary positions are developed in the chart area as an extension of the primary control. The position of the impact point is provisional since it was located in respect to surrounding features.

NAMES

Feature names are adopted from the 1935 International Astronomical Union nomenclature system as amended by Commission 16 of the I.A.U., 1961 and 1964

Supplementary features are associated with the named features through the addition of identifying letters. Craters are identified by capital letters. Eminences are identified by Greek letters.

A black dot is included, where necessary, to identify the exact feature or features named.

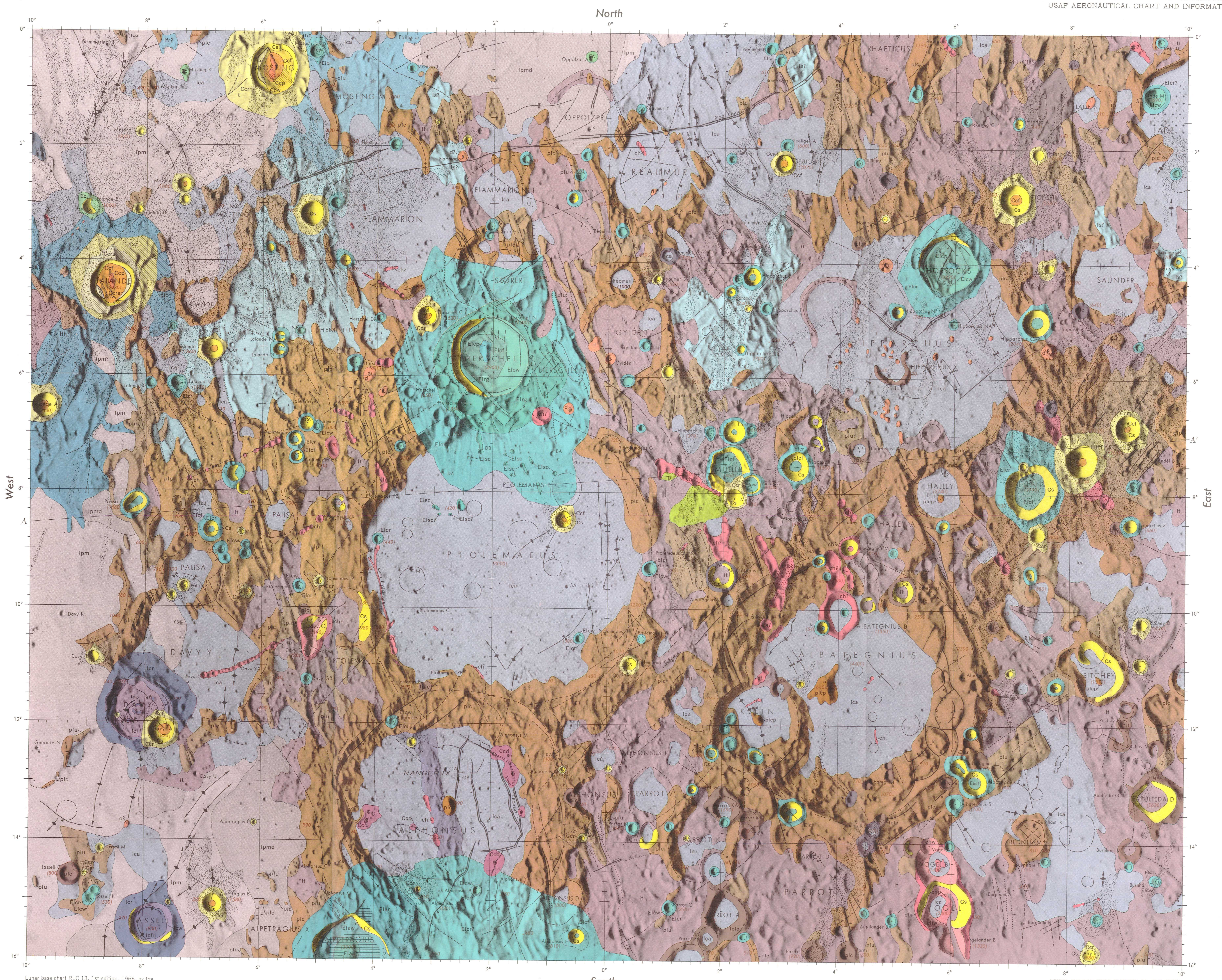
ELEVATIONS

All elevations are shown in meters. The relative heights of crater rims and other prominences above the maria and depths of craters were determined by the shadow measuring technique, through correlation with data derived from Ranger IX and earth based photography. Vertical heights thus established have not been referenced to a vertical datum.

Depth of crater (rim to floor)	(400)
Relative elevations (referenced to surrounding terrain)	300.

RELIEF PORTRAYAL

The configuration of the relief features shown on this chart is interpreted from Ranger IX television records in the area of effective coverage. Supplementary clarification has been effected through visual observations made with the 24" Lowell Observatory refracting telescope, Flagstaff, Arizona, and the use of telescope photography. The pictorial portrayal of relief forms is developed using an assumed light source from the west, with the angle of illumination maintained equal to the angle of slope of the features portrayed. Cast shadows are eliminated to enable complete interpretation of relief forms.

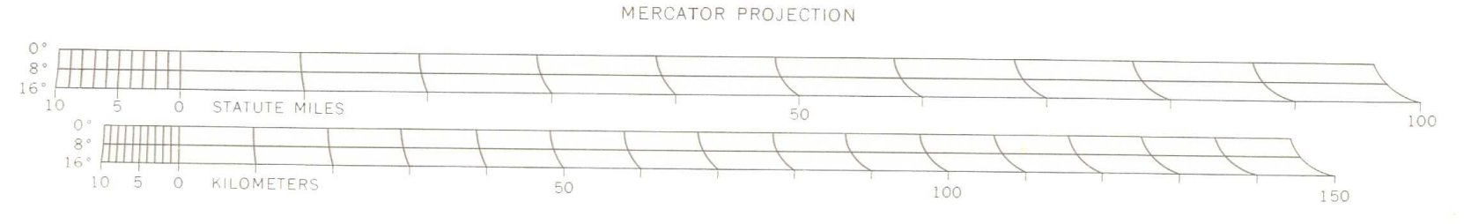


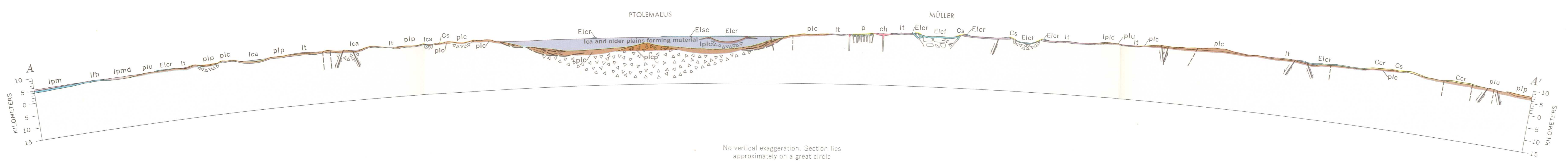
Lunar base chart RLC 13, 1st edition, 1966, by the USAF Aeronautical Chart and Information Center, St. Louis, Missouri 63118

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1968—G68278

Sources of geologic information: Published and unpublished photographs from the Lick, Mt. Wilson, and U.S. Naval (Flagstaff, Arizona) Observatories; published pictures from the Ranger IX spacecraft; and visual observations by the authors with the 36 inch refractor, Lick Observatory

SCALE 1:1 000 000 AT 11°00'45"
MERCATOR PROJECTION





No vertical exaggeration. Section lies approximately on a great circle

GEOLOGIC MAP OF THE PTOLEMAEUS QUADRANGLE OF THE MOON

By

Keith A. Howard and Harold Masursky

1968

EXPLANATION

COPERNICAN SYSTEM

Cs
Slope material
Characteristics
Albedo high to very high. Present on steep slopes and on floors of some small craters
Interpretation
Fresh colluvium and bedrock exposed by active mass wasting on steep slopes

▨
Dark material
Characteristics
Albedo intermediate, darker than that of surrounding slope, floor, wall, rim, and rays of Copernican craters. Relief not visibly different from that of underlying material, except that rim of Lalande may be slightly subdued
Interpretation
Possibly thin blanket of volcanic ash, superposed on underlying units

Ccr | Ccrs | Ccw | Ccf | Ccp
Crater material
Characteristics
Material of rayed craters, most of which have anomalously low cooling rates during eclipse; albedos high to intermediate
Ccr, *rim, undivided. Hummocky around craters wider than 15 km; appears smooth on smaller craters*
Ccrs, *steep hummocky rim of Lalande*
Ccw, *wall. Steep slopes; varies from hummocky to smooth; albedo intermediate*
Ccf, *floor. Level or gently sloping; partly hummocky in larger craters, smooth and gradational with wall in smaller craters*
Ccp, *peak. Irregular central hill rising above floor*
Interpretation
Materials of impact craters
Ccr and Ccrs, *fine ejecta covers rim; hummocks of rim may reflect bedrock fault blocks and slices*
Ccw, *colluvium, slumps, and local bedrock outcrops*
Ccf, *breccia, fallback, and slumps*
Ccp, *structurally complex dome uplifted during or after cratering*

Ray material
Characteristics
Albedo very high to intermediate, grades to that of surrounding material. Distribution patchy or streaky. Relief not visibly different from that of underlying units
Interpretation
Material freshly exposed by secondary impact of small fragments ejected from both primary and secondary impact craters

Ccd
Dark halo crater material
Characteristics
Albedo low; smooth; on Ranger IX photographs appears to subdue topography; thins away from central crater
Interpretation
Tephra derived from maars

ERATOSTHENIAN SYSTEM

Elcr | Elrg | Elcw | Elcf | Elcp
Crater materials
Characteristics
Materials of sharp, well-formed, nonrayed craters. Some have anomalously low cooling rates during eclipse (Herschel and Hipparchus G are more anomalous than many rayed craters)
Elcr, *rim. Arzachel rim material (?), south of Alphonsus, is gently hummocky to rolling and appears to fill older features thickly; outer limits discernible only where superposed on flat terrain. Herschel rim has radial pattern or is gently hummocky; outer limits discernible only where superposed on flat terrain. Rim of Horrocks is hummocky. Rim of Müller is broken by craterlets, but is otherwise smooth and not hummocky*
Elrg, *grid-patterned rim. Has abundant lineaments trending northeast and northwest. Outer limits of unit very approximate*
Elcw, Elcf, *and* Elcp *are similar to corresponding wall, floor, and peak units of Copernican craters*
Interpretation
May include Imbrian or older craters in area between Palisa and Herschel, where units Ica *and* It *are thin or absent so age relations are uncertain. Herschel, Horrocks, and Arzachel, which are morphologically similar to rayed craters, are impact craters; subunits similar in origin to corresponding subunits of Copernican craters; grid lineaments on inner rim of Herschel reflect blocks of bedrock jostled along pre-existing fractures by impact. Smooth rim of Müller suggests it may be a caldera*

Elsc
Satellitic craters
Characteristics
Small craters clustered near Herschel; some on small valleys radial to Herschel
Interpretation
Craters formed by secondary impact of projectiles ejected from Herschel

Elar | Elaw | Elap
Material of the crater Alpetragius
Characteristics
Elar, *rim. Forms thin mantle that appears to subdue pre-Imbrian bedrock north of crater; rim crest on north only very slightly higher than surrounding terrain. Forms rugged rim, convex upward, east and south of crater, albedo intermediate; boundaries uncertain*
Elaw, *wall and floor. Partly terraced; albedo intermediate*
Elap, *peak. Smooth and very regular dome; albedo intermediate in northwest half and intermediate to high in southeast half*
Elaw *and* Elar *ruled where slightly darker*
Interpretation
A non-impact origin for Alpetragius is suggested by the regularity of the central peak, the absence of a high and hummocky rim on the north, the presence of a thin rim blanket 1½ crater radii from the crater on the north, the peculiar convexity of the southeast rim, and the apparent continuity of major wall faults out onto the rim. The crater may be a caldera; central peak may be a resurgent dome; rugged part of rim possibly viscous lava, or else steepness is structural; thin part of rim possible tuff; ruled area may delineate late thin ash deposit

Ec
Crater material
Rim and wall of rayless craters. Albedo intermediate. Appear smooth

IMBRIAN SYSTEM

Ipm | Ipmd | Iph
Procellarum Group
Characteristics
Ipm, *mare. Albedo low; forms plains of low relief and low crater density*
Ipmd, *dark mare. Albedo low, lower than that of* Ipm; *forms plains of low relief and low crater density; most contacts with* Ipm *gradational*
Iph, *hill surface. Albedo low; covers low smooth hill of irregular outline*
Interpretation
Volcanic flows, tuff beds, or both. Great extent and low relief suggest deposition by very fluid lava or ash flows. Iph *probably thin covering (ash?) on old hill.* Ipmd *may be mostly younger than* Ipm

Icr | Icw | Icf | Icfd | Icp
Crater material
Characteristics
Icr, *rim. Smooth around Lassell; smooth to hummocky on Davy; albedo intermediate*
Icw, *wall. Albedo intermediate*
Icf, *floor. Material with concentric pattern in shallow floor; albedo intermediate*
Icfd, *dark floor. Low-albedo material with concentric ridges and small local depressions in shallow floor*
Icp, *peak*
Interpretation
A caldera origin for Lassell is suggested by smooth rim and dark, structured, shallow floor; floor material is probably similar to Procellarum Group. Davy has hummocky rim and irregular central peaks that are more suggestive of impact origin; subunits may correspond in origin to those of Copernican craters

Ica
Cayley Formation
Characteristics
Forms level or nearly level plains in terra. Albedo intermediate. Ghost craters and low ridges common. Crater density as high or higher than that of Procellarum Group. Pattern, in northeast corner of quadrangle, indicates where Cayley is finely hummocky
Interpretation
May be either (1) old mare-like material lightened through age, (2) accumulated fine ejecta from many distant impact sources, (3) debris deposited by some colluvial process capable of long-distance transportation over flat surfaces, (4) material deposited as low-viscosity fluid, such as ash flows, that shed off highs, leaving only a thin mantle (unit It*), and ponded in basins, or (5) a mixture of these. The gradational character of the contact with unit* It*, and the presence of small flat ponds of Cayley high in the mountains favor the ash-flow and colluvium hypotheses. The possibility of differential compaction over buried features, suggested by ghost craters and ridges, further supports the ash-flow hypothesis. Hummocky Cayley in Lade may be constructional volcanic topography, or may be unit* h *partly buried by Cayley*

It
Terra material
Characteristics
A mantling material in hilly uplands; smooths but does not obliterate underlying hills and craters; local relief less than 1,000 meters. Albedo intermediate. Appears gradational with Cayley Formation; locally includes small Cayley "pools". Contacts with older units are gradational and are drawn where rugged surfaces appear subdued enough that half the present morphology reflects the It *mantle*
Interpretation
Thin mantle of Cayley Formation; thickness decreases with increasing roughness of underlying terrain. Part is colluvium

Ic
Crater materials, undivided
Characteristics
Rim, wall, and floor of small craters that intersect Imbrian sculpture, but are not sharp, and appear subdued by a thin mantle of unit It
Interpretation
Materials of craters that are older than unit It *but younger than Fra Mauro Formation*

Iplc
Crater materials, undivided
Characteristics
Rim, wall, and floor of subdued craters that neither intersect nor are intersected by Imbrian sculpture
Interpretation
Materials of craters whose stratigraphic position is uncertain

Ifh
Fra Mauro Formation, hummocky
Characteristics
Material characterized by randomly distributed hummocks 1 to 2 km across; albedo mostly intermediate; has sparkling appearance on full-Moon photograph, caused by highlights of high albedo on small areas of steep slope. Abundant craterlets smaller than 1 km. Area southeast of Lalande more coarsely hummocky than rest of unit, and has few craterlets
Interpretation
Impact ejecta from the Imbrium basin

Ifr
Fra Mauro(?) Formation, ridged
Characteristics
Forms low, irregular, intersecting ridges oriented roughly north; albedo intermediate to low. Appears gradational with unit Is
Interpretation
Probably ejecta from Imbrium basin

Is
Smooth material
Characteristics
Forms smooth rolling surface with rounded valleys and ridges; appears to mantle valleys and hills equally thickly, including ridges radial to Imbrium basin; albedo intermediate to low
Queried areas appear underlain by a thick filler that rises above plains and greatly subdues underlying Imbrian sculpture; rolling and smooth, except that parts are rough on a fine scale; large patch west of Hipparchus is overlapped by unit It*, but other patches appear gradational with unit* It
Interpretation
Possibly fine ejecta from Imbrium basin; however, origin might be similar to that of Cayley Formation and unit It

PRE-IMBRIAN

pIp
Plateau material
Characteristics
Forms extensive rolling plateaus; albedo intermediate to high
Area west of Ptolemaeus has moderately high density of Imbrian and younger craters, especially chain craters, but pre-Imbrian craters are sparse and very subdued; broken in places by Imbrian sculpture; overlain locally by unit It*, which is darker, and unit* Is
Area east of Hipparchus appears superposed on and largely obliterates rugged highlands; contacts with younger units appear sharp; crater density low
Interpretation
Volcanic rock or colluvium; area west of Ptolemaeus may be ejecta from Ptolemaeus. Younger than many areas mapped as pIc *or* pIu*; low crater density and lack of sculpture in eastern patch suggest that patch may be as young as Imbrian*

pIc | pIcp
Crater material
Characteristics
Remnants of craters that show some Imbrian sculpturing
pIc, *rim and wall of crater (includes floor of smaller craters on the cross section)*
pIcp, *central peak. Albedo intermediate to high; central peak of Alphonsus has high albedo*
Interpretation
Craters that have been considerably modified by slumping, mass wasting, faulting, superposed cratering, isostatic rebound, and infilling. Albategnius Alphonsus, Ptolemaeus, and Hipparchus are progressively shallower and less rugged and show a gradationally increasing sequence of modification from craters like Copernicus or Tycho. Similarities to Copernican craters and the apparent relative scarcity of large young volcanic craters on the Moon suggest that most pre-Imbrian craters originated by impact

pIu
Undivided material
Rugged uplands, extensively faulted and lacking obvious crater forms; albedo intermediate to high. May locally include material younger than pre-Imbrian

UNITS NOT ASSIGNED AGES

ch | chr | chw | chp
Chain crater material
ch, *undivided*
chr, *rim*
chw, *wall*
chp, *peak*
Characteristics
Material of alined craters, mostly having low rims; albedo intermediate. Davy G has anomalously low cooling rate during eclipse. Subunits shown only in Davy G and Vogel chain
Interpretation
Maars and calderas; possibly some small chain craters are secondary craters

p
Pitted material
Characteristics
Highly pitted, with pits or craterlets ½ to 2 km across; larger patch, southwest of Müller, is raised slightly and is gently convex; albedo intermediate
Interpretation
Tephra and other ejecta in maar fields

d
Domes and cones
Characteristics
Domical hill, or conical hill having summit crater; albedo intermediate
Interpretation
Volcano or surface expression of intrusion; some may be merely eroded and partly buried non-volcanic hills

h
Hummocky material
Characteristics
Forms equidimensional hummocks 1 to 4 km across; albedo intermediate
Interpretation
Possibly volcanic domes and cones, or may be fault blocks

r
Ridge material
Characteristics
Forms low central ridge of Alphonsus; not rugged, but rougher than Cayley Formation; albedo intermediate; an albedo boundary crosses the topographically defined contact between ridge and Cayley Formation
Interpretation
Possibly volcanic material similar to Cayley Formation. Alinement of ridge parallel to Imbrian sculpture suggests control at depth by a fracture or fractures caused by the Imbrium basin event

———— —?— ——
Contact
Dashed where approximately located or gradational; queried where assumed

Inferred fault
Dashed where approximately located; dotted where concealed. Bar and ball on apparent downthrown side of scarp (ball on line indicates narrow graben); hachures indicate fault scarp against which younger rocks were deposited (on side with hachures). Arrows show apparent movement. Triangles on upper plate at toe of slump block

- - - - - - - - - - - - - - - -
Lineament
Linear depression with no apparent offset; may appear as slight change in brightness; locally grades into graben
Interpretation: Fracture; some are buried; some probably enlarged by collapse, erosion, or explosive volcanism

Ridge
Line marks crest. Arrow indicates tapered end

Trough
Line marks axis

Gentle scarp
Line marks base. Barbs point downslope

Fractured rock
Shown on cross section beneath crater floors
Interpretation: Rock extensively fractured by impact

Crater rim crest

Concealed crater or crater chain
Symbol indicates rim crest

Rimless depression
Irregular or circular depression having little or no rim
Interpretation: Collapse feature; perhaps some are modified by explosive volcanism

Summit crater or dark-halo crater

GENERAL INFORMATION

The application of stratigraphic and structural principles to geologic mapping of the Moon from telescopic photographs has been discussed by Shoemaker (1962) and Shoemaker and Hackman (1962). Major geologic units are recognized by regional topographic and albedo differences. Pictures returned by Ranger, Surveyor, and Lunar Orbiter spacecraft show that a fragmental regolith, presumably produced by repeated impact and mass wasting, has formed on all but the very youngest of these units. In the Ptolemaeus quadrangle, ages assigned to the rock units are tentative, and correlations with the major lunar time-stratigraphic units whose type localities are in the vicinity of Mare Imbrium are uncertain. Materials of each crater are together considered an informally named formation. Craters smaller than 3 km are not shown on the map, except for those that are satellitic, brightly rayed, or part of a chain. Approximate numerical albedo values (Pohn and Wildey, 1966) corresponding to the qualitative terms used here are as follows: low, 0.10 to 0.12; intermediate, 0.12 to 0.14; high, 0.14 to 0.16; very high >0.16. Eclipse thermal data are from Saari, Shorthill, and Fulmer (1966). Detailed studies of the Alphonsus area, based on Ranger IX pictures, appeared in a report by Heacock and others (1966). A geologic map of the crater Alphonsus and environs was prepared by Carr (1966).

GEOLOGIC SUMMARY

The Ptolemaeus quadrangle is near the center of the lunar disk, in the northern part of the southern highlands. Smooth dark maria border the quadrangle on the west and north, but most of the area is complex, highly cratered terra.

STRATIGRAPHY

Pre-Imbrian rocks occur at or near the surface in much of the terra. Pre-Imbrian craters have been considerably modified by slumping and other mass wasting, faulting, impact cratering, possible isostatic rebound of the floors (Masursky, 1964), and mantling and filling by younger materials. The craters Albategnius, Alphonsus, Ptolemaeus, and Hipparchus are successively more modified in the order mentioned, corresponding to increasing age. Incomplete mountain rings that appear to represent large craters even more obliterated than the aforementioned are present in the northwest and east-central parts of the quadrangle; and the eastern border of Mare Nubium, in the southwest, may be the remnant of a crater over 200 km across.

Plateau material (unit pIp), which forms rolling plateaus having a low density of old craters, appears to represent accumulations of ancient strata. Alternatively, this unit may record leveling by long-continued mass wasting of areas that once were rugged.

The Fra Mauro Formation, present in the north, is interpreted to be impact ejecta derived from the Imbrium basin, which lies several hundred kilometers north-northwest of the quadrangle. A typically hummocky facies (unit Ifh) near Lalande, in the northwest, is characterized by abundant small hummocks but low total relief, and resembles the hummocky Fra Mauro of the type area (Riphaeus Mountains region)(Eggleton, 1964; 1965). A unit (Ifr) near Mösting that is probably a facies of the Fra Mauro is characterized by low irregular ridges trending generally northward. Both facies (units Ifh and Ifr) locally grade outward into smooth material (unit Is) that appears to blanket hills and valleys with nearly constant thickness and so is tentatively interpreted as a fine-grained facies of Imbrium basin ejecta. Blanketing material in the northeast part of the quadrangle (unit Is?) may also represent farflung ejecta from Imbrium.

The Cayley Formation is widespread in the quadrangle, and though it probably covers a range of ages, it is a convenient marker relative to which most features in the terra can be dated. The Cayley forms plains of medium albedo (unit Ica) in terra basins distributed throughout the quadrangle. Ranger IX pictures of the Alphonsus area show that level "ponds" of Cayley were deposited even in very small basins high in the mountains. In addition, the topography of much of the hilly terrain between Cayley-filled basins is greatly subdued, apparently by a thin mantle of Cayley. Where this mantle exerts greater control on the topography than the underlying rugged surface, it is mapped as terra material (unit It), rather than as an older unit. Apparently, the Cayley and its thin equivalent mantle most of the terra in the eastern two-thirds of the quadrangle, including rugged areas where older rocks are the dominant control on topography. The material is probably of mixed origins, and undoubtedly includes mass-wasted detritus, but deposition of much of it is tentatively attributed to extensive fluid flows, perhaps ash flows, that shed off highs, leaving only a thin mantle, and ponded in basins. Multiple scattered sources seem likely considering the extensive area covered. The depositional mantle over hilly areas appears to thicken to the north, possibly because of an underlying blanket of Fra Mauro Formation. Where datable, the Cayley postdates the Fra Mauro Formation and predates the Procellarum Group, so it is tentatively assigned to the Imbrian System; however, it may span a wide range of ages. For example, rim deposits of the craters Arzachel (south of Alphonsus, in the Purbach quadrangle) and Herschel, which overlie large areas of Cayley Formation, locally appear to be smoothed by material that may be younger Cayley. As a stratigraphic convention, features definitely muted by Cayley or unit It are dated as Imbrian or older, and features superposed on the Cayley or unit It are dated as Imbrian or younger.

Mare materials of the Procellarum Group (units Ipm and Ipmd), thought to be sheets of volcanic rock, flank the terra on the east and north. In the southeast part of the quadrangle, rim material of the crater Davy, and perhaps also that of Lassell, overlies the Cayley Formation and is overlain by the Procellarum Group, thus establishing a time lapse between deposition of the Cayley and Procellarum. The surface of the Procellarum, besides being darker, is generally flatter than that of the Cayley and has fewer superposed craters. Nevertheless, distinction of the Procellarum from the Cayley is uncertain in ray-covered areas, as between Lalande and Mösting, and locally, as south of Davy Y, Cayley and Procellarum appear to be graditional.

CRATERS

The craters of the quadrangle are of varied form and origin. An impact origin is presumed for the rayed craters, as well as for others such as Herschel, Halley, and Horrocks whose morphology is similar to that of the rayed craters. Similar morphologic features include a hummocky rim, concentric wall slumps, irregular central peak, and (in the case of Herschel) satellitic craters. The several very large pre-Imbrian craters appear to have been modified with time from original forms much like that of Copernicus, and their formation is likewise ascribed to impact. On the other hand, certain young craters have smooth rims and other features not typical of classic impact craters (McCauley, 1967) and thus may not have formed by impact. For example, Müller with its smooth rim, Alpetragius with its regular dome, and Lassell with its dark, structured floor might better be explained as calderas, though diagnostic criteria are lacking.

Some craters are certainly volcanic. Among the abundant landforms thought to indicate volcanism are chain craters (ch units), highly pitted raised areas (unit p), domes and cones (unit d), and dark-halo craters situated on rilles or lineaments (unit Ccd). Some of these craters predate the Cayley Formation, such as the impressive Vogel chain or the chain craters on the north side of Albategnius, which are mantled by unit It and Cayley Formation. Others, such as the chain craters northeast of Davy, or the pitted unit p east of Ptolemaeus, postdate the Cayley materials. Davy G is considered to be young because it cools anomalously slowly during eclipse. Dark-halo craters on the floor of Alphonsus are tentatively dated as Copernican because of their similarity to features superposed on Copernican rays elsewhere on the Moon. Reports of spectrographic changes in Alphonsus (Kozyrev, 1962) raise the possibility of current volcanic activity. Thus volcanism of one sort or another appears to have operated throughout much of the decipherable history of the quadrangle.

STRUCTURE

A prominent structural grain trending north-northeast in this region forms part of the "sculpture" that Gilbert (1893) noted radial to the Imbrium basin. In the Ptolemaeus quadrangle, the varied features making up Imbrian sculpture include steep-walled grabens, horsts, elongate depressions that may be collapse features, and lineaments and scarps inferred to be fractures and normal faults; these features apparently record extension concentric to the Imbrium basin. Crater chains, dark-halo craters situated on rilles, and perhaps also some rimmed V-shaped valleys indicate that fractures following the sculpture direction have been sources of erupting volcanic material from early Imbrian through Copernican times. Their close spatial association with the Imbrium basin suggests that most of the fractures were produced by the Imbrium impact, and many features in the quadrangle are tentatively dated on the assumption that Imbrian sculpture cutting them or cut by them is early Imbrian in age. Nevertheless, later movement on some of the faults alined with the sculpture system is shown by rilles in Ptolemaeus and Alphonsus cutting Cayley Formation, and by scarps crossing the post-Cayley crater Hind. Furthermore, the much greater prevalence of sculpture in this region than in other sectors radial to Imbrium (Hartmann, 1963) suggests that the direction followed by the sculpture here was partly determined by an anisotropy existing prior to the Imbrium impact.

Lineaments striking northeast also form a conspicuous structural grain in the quadrangle. This lineament set includes major broad ridges flanking both Albategnius and Hipparchus, and two apparent right-lateral wrench faults, one east of Alphonsus and another east of Hind. Except for this set of lineaments, most of the faults and fractures mapped in the quadrangle appear to be unrelated to a global "grid" system.

SUMMARY

The earliest recognizable events in the geologic history of the Ptolemaeus quadrangle are extensive cratering and deposition of some regional strata in pre-Imbrian time. The Imbrium impact event produced deep radial fractures across the terra and deposited ejecta (Fra Mauro Formation) in the northern part of the quadrangle. The plains-forming Cayley Formation, which may be ash-flow tuff, accumulated over most of the terra, ponding in basins. Mare material of the Procellarum Group flooded lowlands along the western and northern margins of the terra. Cratering by both impact and volcanism, and fracturing and faulting continued throughout Imbrian and later time.

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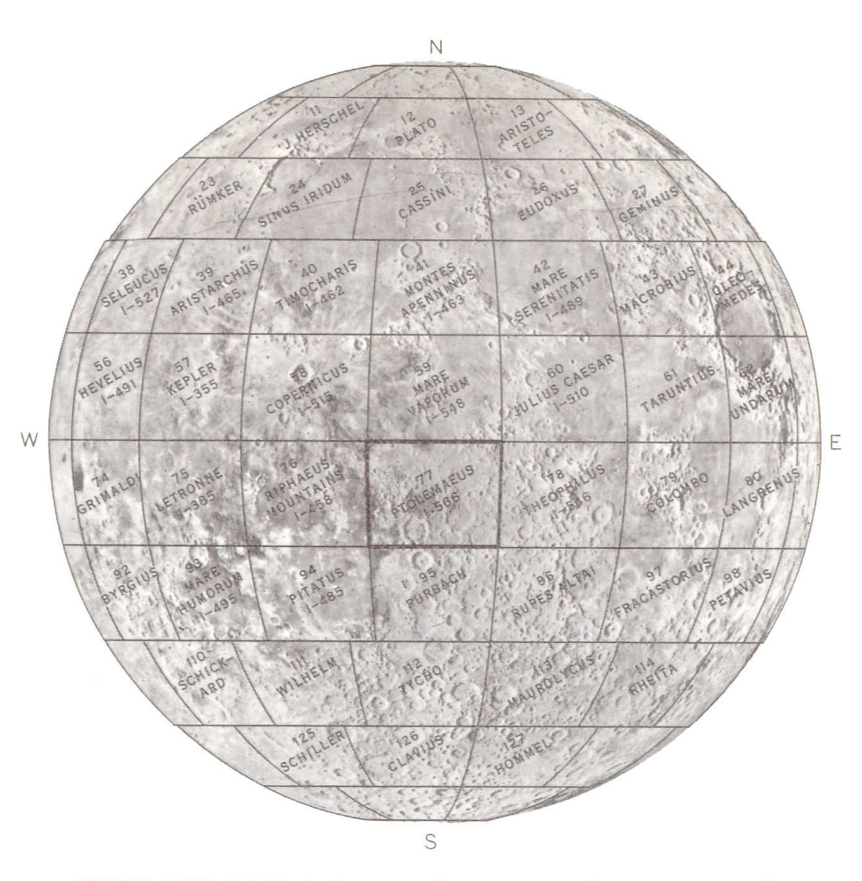

INDEX MAP OF THE EARTHSIDE HEMISPHERE OF THE MOON
Number above quadrangle name refers to lunar base chart (LAC series); number below refers to published geologic map

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