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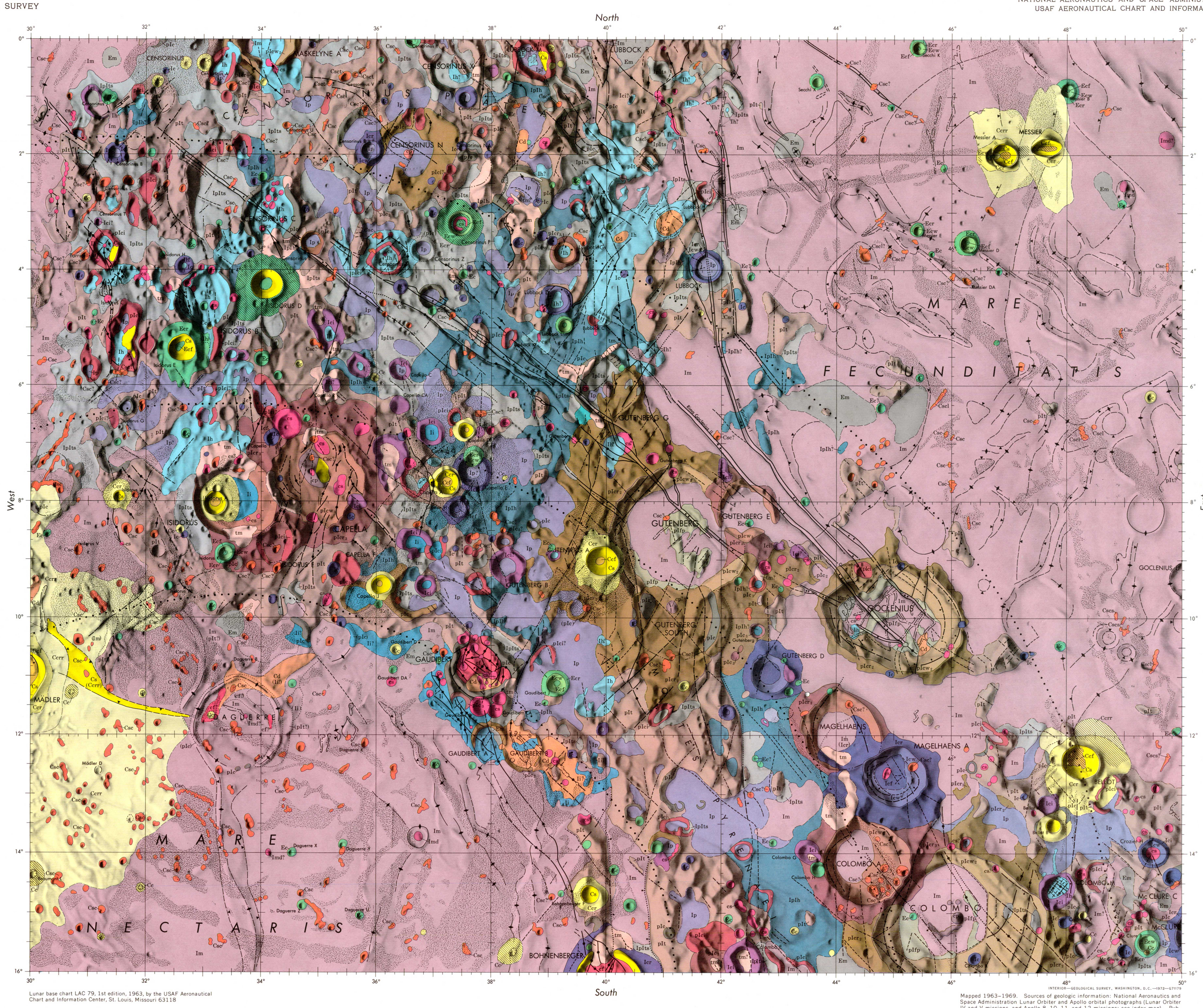
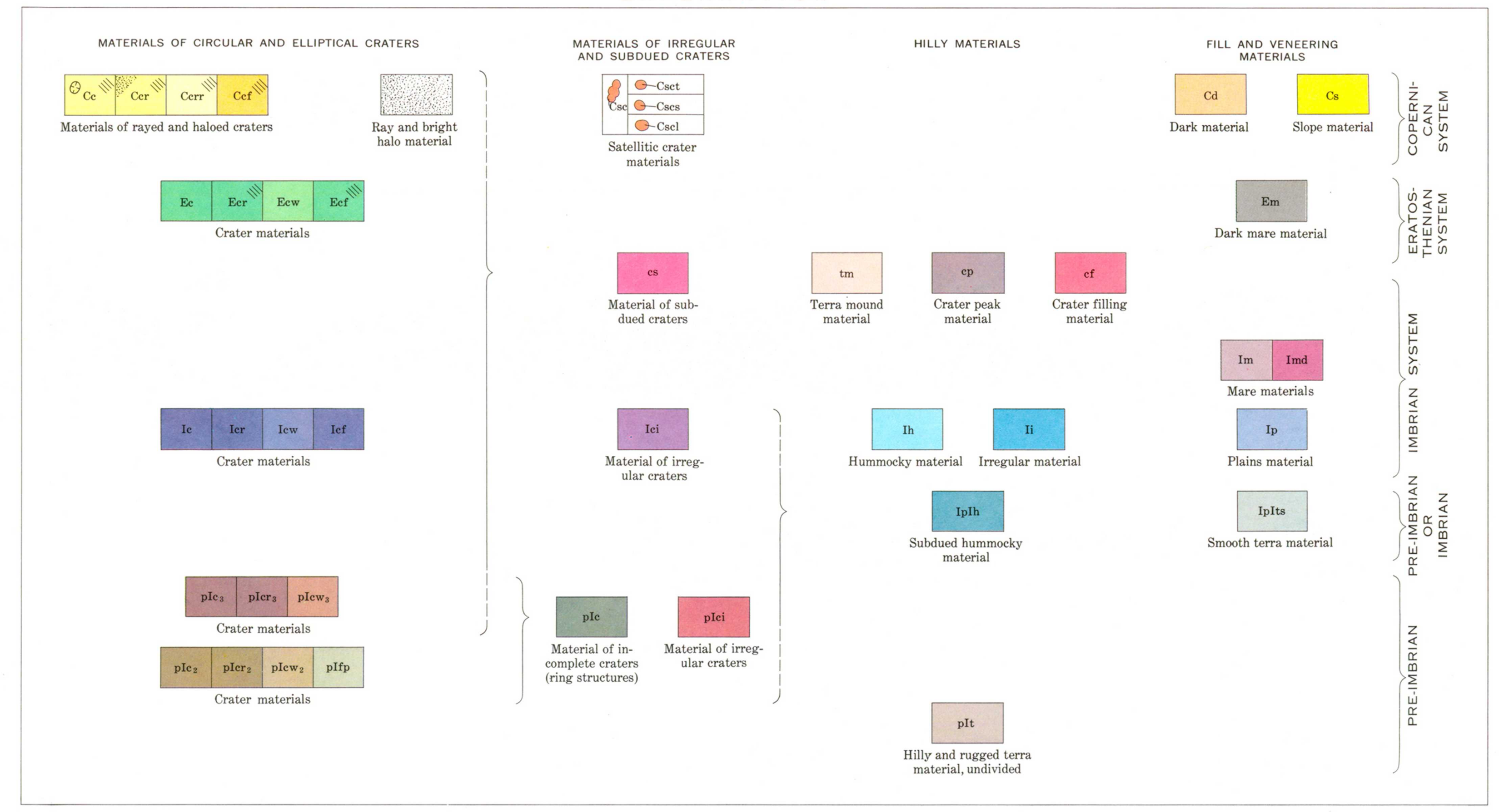
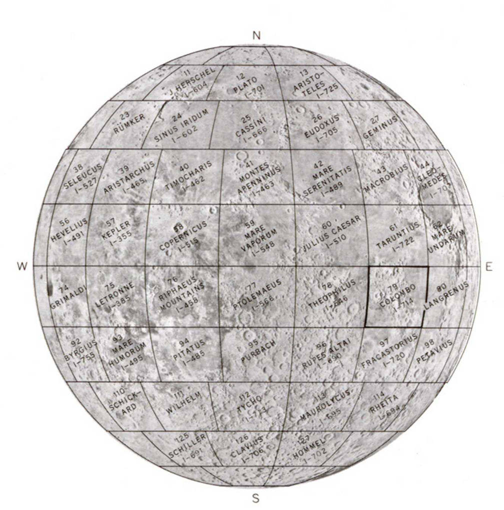


EXPLANATION



INDEX MAP OF THE EARTHSIDE HEMISPHERE OF THE MOON



LUNAR ORBITER AND APOLLO PHOTOGRAPHIC COVERAGE OF COLOMBO QUADRANGLE

GEOLOGIC MAP OF THE COLOMBO QUADRANGLE OF THE MOON

By
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INTRODUCTION

Relative ages of structures and geologic units have been determined from intersection and apparent overlap relations and from morphologic freshness reflecting degree of preservation. The fivefold crater-age sequence is based on the classification of Shoemaker and Hackman (1962), and corresponds broadly to a modified classification of Pohn and Offield (1970) and Offield (1971). Rock units in the quadrangle are provisionally correlated with time-stratigraphic units first described in and near the Imbrium basin (Shoemaker, 1962 a, b; Shoemaker and Hackman, 1962, Shoemaker and others, 1963) and subsequently recognized elsewhere on the near side of the Moon (McCauley, 1967; Wilhelms, 1970; Wilhelms and McCauley, 1971). Some aspects of the geology of this quadrangle are reported elsewhere (Elston, 1964; 1965, 1966 a, 1968, 1971; and Lunar Orbiter Photo Data Screening Group, 1968, p. 54–57; 60–62).

A variety of terra and mare materials in and around the northeast part of the ancient multi-ringed Nectaris basin are included in this quadrangle. Diverse features and structures both related to and younger than the Nectaris basin are preserved because the region lies well away from younger basins (Offield and Pohn, 1970; Stuart-Alexander and Howard, 1970), and escaped masking effects that accompanied their formation.

Four broad categories of materials are recognized: (1) materials of circular and elliptical craters (mainly impact craters); (2) materials of irregular and subdued craters (volcanic craters and calderas, secondary impact craters, and craters of uncertain origin); (3) hilly materials that form constructional or chaotic terrains (volcanic or basin-related); and (4) fill and veneering materials (mainly volcanic).

GEOLOGIC UNITS

MATERIALS OF CIRCULAR AND ELLIPTICAL CRATERS

Structural and morphologic characteristics of these craters and materials appear mainly attributable to impact. Features include floors that lie far below crater rim crests and the general level of the surrounding terrain; smooth and terraced crater walls; near-circular to elliptical rim crest outlines; hummocky rim materials that grade away from the craters into ropy and braided radial-rim facies; and surrounding rays and swarms of satellitic craters. Rays and fine-scale morphologic features are apparently degraded and lost with increasing age.

Craters assigned to the Copernican, Eratosthenian, and Imbrian Systems (units Cc, Ec, and Ic, respectively, and their subdivisions) have a decidedly youthful morphology. The craters and their rim deposits are mostly complete, and crater rim crests are fairly sharp. Copernican craters—the youngest craters—exhibit halos under full-Moon illumination; large craters, such as Theophilus (60 km west of the Colombo quadrangle and about 95 km across), are surrounded by rays containing pronounced arcuate chains of satellitic or secondary impact craters (unit Csc). Eratosthenian craters are morphologically similar to Copernican craters, but they are somewhat degraded and they lack distinct bright or dark halos in their rim deposits. Imbrian craters display smooth, intermediate-albedo rim materials; crater walls are mostly smooth and short; the floors contain various filling materials that include crackled and bulbous constructional material, hilly materials, and fairly smooth plains material; rim crests are subpolygonal to nearly circular, fairly sharply defined, and largely complete. The identifiable rim deposits are somewhat narrower and the rim crests more subdued than in Copernican and Eratosthenian craters of comparable size. Imbrian craters predate emplacement of mare material (unit Im) that forms most of the present mare surface. Pre-Imbrian craters form that part of the crater population which appears decidedly old. They formed between the times of formation of the Nectaris and Imbrium basins. Two general ages (unit pIc_2 and pIc_3 and their subunits), which broadly correspond to craters of middle and late pre-Imbrian age mapped elsewhere on the Moon (Offield, 1971), are recognized. In contrast to the Imbrian craters, pre-Imbrian craters commonly display topographically more irregular rim materials and rim crests, and their walls are more commonly hummocky and channeled. Several craters mapped as pre-Imbrian are larger than the largest Imbrian craters.

The elliptical pair of Copernican craters Messier and Messier A, in the northeast, is inferred to have formed by a low-angle double impact from the east (of a body which may have fissioned shortly before impact) on the basis of asymmetric crater shapes and ejecta patterns (Elston, 1967, 1968, 1971). Their elliptical shapes indicate an impact angle of perhaps 15° or less from horizontal judging from experimental hypervelocity impact studies by Gault, Quaide, and Oberbeck (1966; 1968, p. 95–96 and fig. 14). A larger and older elliptical oblique impact crater may be represented by Goclenius (pre-Imbrian), which measures 50 by 75 km.

Dark, smooth parts of the rim deposits of the Messier pair may indicate that dark volatile-rich materials were introduced into the ejecta by the impacting body (Elston, 1971). Similar dark smooth halos occur at other presumed impact craters, notably Bellot, whose rim is dark where on mare and brighter where on uplands. The contrast between these young craters that have dark or light-dark streaky rims, and young blocky bright-halo craters such as Censorinus, may indicate fundamental differences in composition of the impacting body.

There is an apparently anomalous overlap relation between the craters Isidorus and Capella. Isidorus appears less degraded, therefore younger than, Capella, but seems to be overlapped by the Capella rim. This apparent paradox may result from (1) deposition of younger volcanic rocks (unit tm) which gives the illusion of being part of the Capella rim; (2) Isidorus having formed too far away to have breached the topographically higher Capella rim; or (3) a volcanic origin of Capella giving it a