Papers presented to the

CONFERENCE ON
THE LUNAR HIGHLANDS CRUST

Houston, Texas
14-16 November 1979

A Lunar and Planetary Institute
Topical Conference

UNIVERSITIES SPACE RESEARCH ASSOCIATION
LUNAR AND PLANETARY INSTITUTE
3303 NASA ROAD 1
HOUSTON, TEXAS 77058
DISTRIBUTION AND AGES OF LIGHT-COLORED PLAINS ON THE MOON.
Ann W. Gifford and Parouch El-Baz, National Air and Space Museum, Smithsonian Institution, Washington, DC, 20560

Smooth, light-colored plains constitute a significant portion of the lunar surface. These plains are considered part of the lunar highlands based on the facts that: (1) their albedo is high, .150 on the average; (2) they show high Al/Si ratios in the results of X-ray fluorescence experiments (ref. 1); and (3) the Apollo 16 returned samples show that the plains in that site are impact breccias of anorthositic composition. The light-colored plains are widely distributed on the Moon within old basins, inside craters of varying sizes, and within inter-basin and inter-crater areas. Their most significant characteristic is a nearly flat surface; they are the least rugged of all lunar highland units.

Due largely to their smooth appearance, the origin of the lunar light-colored plains has been attributed to fluidized primary basin ejecta (ref. 2), ejecta from secondary basin impacts (ref. 3), and volcanism, at least in the case of the lunar "pitted plains" (refs. 4 and 5). The theory that light plains-forming materials may be ejecta from multi-ring basins or large craters is based on the fact that the Apollo 16 returned samples are nonvolcanic breccias. These interpretations have been applied to post-Apollo lunar geologic mapping. However, other interpretations should not be ruled out.

Three U.S. Geological Survey geologic maps cover the lunar limbs and farside (50°E to 50°W, 50°N to 50°S) at a scale of 1:5,000,000 (East Side, Central Far Side, and West Side; refs. 6, 7 and 8 respectively). These maps include plains units mapped as Nectarian, Imbrian-Nectarian, and Imbrian (Fig. 1). Several interesting patterns are apparent from this compilation based on the three maps.

The oldest plains units occupy large areas on the floors of the pre-Nectarian basins Al-Khwarizmi-King, Lomonosov-Fleming, Cagarin, and an unnamed basin centered at 10°N 175°E. Extensive plains units only slightly younger also occur in Mendeleev, Korolev, and Apollo. In order to support a secondary ejecta debris origin (ref. 9) for these oldest plains ejecta from several large Nectarian basins would have to be invoked to account for the areal extent. These plains are not necessarily older analogues of the Cayley (ref. 10) type plains. Figures 2 and 3 show the morphology of Nectarian and Imbrian-Nectarian plains units. The Lomonosov-Fleming basin in particular contains units which could be mixtures of volcanic material and ejecta debris (Fig. 3).

Imbrian age plains deposits are generally of smaller extent. Approximately 60% of these form crater floors. Over 30% of them are in a band concentric to the Orientale basin, a pattern which is apparent in figure 1. This is in contrast to the Nectarian plains which are mostly found within old basins rather than outside them in the position of ejecta. This suggests that although most Imbrian-age plains including Cayley type units form by the mechanism suggested by Oberbeck et al. (ref. 3), pre-mare volcanism should not be ruled out for the older plains on the basis of present photogeologic mapping. This is also suggested by variations in the overall chemistry of one plains area versus another as in the east side of the Moon (ref. 11).

REFERENCES
Fig. 1. Distribution maps of smooth, light-colored plains on the Moon based on U.S.G.S. geologic maps at 1:5 000 000 scale (ref. 6, 7, and 8).
Fig. 2. The light-colored plains fill of the Mendeleev basin at 7 N, 140 E.

Fig. 3. Nectarian age plains at 20 N 113 E. The mare-filled crater Lomonosov is at the upper edge; the crater Fleming is at the lower left.