The presence of the "dark mantle" in the Apollo 17 landing area has been questioned since return of the mission. Allocated surface samples proved to be mostly mare-type regolith, and Heiken (1) proposes a possible old, pyroclastic, dark stratigraphic unit of glass spheres near the top of the mare basalts instead of a young "dark mantle." In the light of this hypothesis we reexamined areas of both "dark mantle" and younger mare in the vicinity of the landing site, with emphasis on crater studies.

Clusters of small craters in valleys in the nearby highlands were interpreted as cinder cones by Worden (2). A reexamination suggests that they are young fresh craters that impacted into a moderately dark surface layer composed of a mixture of mass-wasted, bright highland material and dark-mantle material. These craters excavated and ejected the underlying buried, and little disturbed, unit of "dark mantle" preserved in the valleys, and thus acquired dark halos that gave them their volcanic appearance. These craters show that the dark unit exists in the highlands, but the craters are not vents.

The areas of old mare material northwest and east of the landing site have been regarded as heavily mantled because of their subdued appearance, low albedo (3), and spectral characteristics (4). Crater counts from a 1:100,000 scale enlarged metric photograph on these old mare surfaces were compared with those on adjacent younger and embaying mare. The data show that the subdued appearance can be attributed to an apparent dearth of 100 m to 200 m diameter craters on the old, mantled mare: the crater counting curves for old and young mare cross in this range, and the craters are apparently twice as abundant on the younger mare (larger craters show expected distributions). This phenomenon can be attributed to failure to recognize many of these smaller craters on the old mare surface, where they are more greatly subdued than on the young mare. The subdued appearance, thought before the mission to reflect mantling (5), is now thought to originate from a thick layer of unconsolidated material and regolith that overlies the old mare basalts. Craters up to about 200 m in size that impact into this layer would penetrate little or not at all into the lava bedrock, their ejecta would consist mostly of soil breccias similar to those of Van Serg crater in the landing area, and they would degrade rapidly, leaving a subdued surface. Based on crater size and Pike's (6) estimate of depth/diameter ratio of initial crater shapes this layer would be at least 40 m thick in places,
and is best interpreted as the dark stratigraphic unit overlain by regolith.

In the traverse area, clusters of secondary craters thoroughly disturb the old mare and any glass-rich, stratigraphic unit possibly present at the base of the regolith. The older cluster in the north part of the traverse area, probably secondary craters from Römer, contributes theoretical ejecta thickness of 5 m from Shakespeare and 3 m from Cochise to the Van Serg locality (based on McGetchin's et al., (7) equation for crater ejecta thicknesses, and modified according to their figure 1). The younger and blockier central cluster (craters larger than 300 m) contributes an aggregate thickness of more than 1 m to the LM/ALSEP area, and 50 cm can be expected from the older crater Camelot at the deep drill site. In addition many other, and some smaller craters belonging to the clusters are present throughout the traverse area and are not represented in the calculations, but would add to the aggregate ejecta thickness.

The ejecta from these crater clusters are composed mostly of excavated basalts, and basalt-rich soil therefore dominates the landing area. The ejecta would overlie any stratigraphic unit of dark glass spheres and pre-central cluster regolith, and the existence of this unit can be deduced only from relatively recent excavations such as the orange and black glass spheres at Shorty crater, and from the relatively large amount of glass in the soil samples throughout the traverse area (1). Further corroboration for the subsurface presence of this stratigraphic unit in the landing area comes from the astronauts, who report bedrock lava exposure as much as 20 m to 30 m below the surface in crater walls, and from seismic investigations (8), which suggest a 30 to 60 m layer of relatively unconsolidated material above the basalt. This layer may well be composed of crater cluster ejecta and regolith with the old, dark stratigraphic unit at the base. We feel that this unit is present throughout the region at the base of the regolith and probably underlies the landing area, but is largely buried by ejecta from the young crater clusters in the area traversed by the astronauts.

REFERENCES

CRATERS, DARK MANTLE, TAUROS-LITROW

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