IMPACT STRUCTURES AS CRUSTAL PROBES: A SUMMARY OF RECENT PROGRESS. Bernard Ray Hawke[1], Paul G. Lucey 1 , Paul D. Spudis[2], and Pamela D. Owensby[1]. 1) Planetary Geosciences Division, Hawaii Institute of Geophysics, University of Hawaii at Manoa, Honolulu, HI 96822; 2) Branch of Astrogeology, U.S. Geological Survey, Flagstaff, AZ 86001.

Impact cratering was a major process during early lunar history. Large basin-forming impacts created major bodies of impact melt and excavated crustal material from a variety of depths that was deposited in a systematic fashion. Thus systematic changes in the composition of basin ejecta deposits may reflect changes in the vertical composition of the lunar crust at the target site. The composition of the associated body of impact melt may represent a homogeneous section of the upper crust. Spectral investigations of the mineralogy of basin deposits in different regions of the lunar nearside should allow the determination of the manner in which curstal composition and stratigraphy changes as a function of position on the Moon. In addition, spectral sutdies of fresh lunar craters provide mineralogical and compositional data concerning the upper levels of the crust as well as insight into the impact cratering process. For a number of years, we have been collecting, analyzing, and interpreting high-resolution near-infrared reflectance spectra (0.6-2.5μm) for lunar crater and basin deposits. The purpose of this paper is to summarize the preliminary results of this effort.

The Orientale basin, on the western limb of the Moon, has served as the prototype for lunar basins for many years, due primarily to its lack of extensive mare flooding and its well-preserved state. Earth-based spectral reflectance data indicate that the Orientale basin ejecta deposits are dominantly anorthositic with compositions ranging from pure anorthosite to anorthositic norite.[1,2] The composition of the high-albedo smooth plains unit on the interior of Orientale is very similar to that of the Cayley plains material sampled at the Apollo 16 landing site. Portions of the Inner Rook ring of Orientale are composed of anorthosite. Deposits of pure anorthosite have also been identified in the inner rings of Nectaris basin.[3,4] However, the results of a recent spectral survey of both the interior and exterior deposits of Nectaris have indicated that they are dominated by norites and anorthositic norites.[3,5]

In contrast, the composition of Imbrium basin deposits is extremely heterogeneous. Both the Apollo orbital geochemical information and Earth-based spectral data suggest that a remarkable diversity of compositions is associated with Imbrium basin. These identified rock types include anorthositic norites, Mg-suite norites and gabbronorites, KREEP basalts, olivine-bearing rocks of the Mg-suite, and exotic, KREEP-rich granitic rocks.[6,7] A wide variety of compositions was also exposed by the Aristarchus impact event. These include gabbro, mare basalt, and an olivine-rich assemblage.[8,9] Tycho crater, on the other hand, exposed only gabbroic rocks.[9,10] Tycho exhibits a dark halo of impact melt. Spectral studies have shown that this halo is rich in impact generated glass.[10,11]

REFERENCES

(1) B.R. Hawke, et al. (1984) LPS XV, 350-351.
(2) P. D. Spudis, et al. (1984) PLPSC 15, C197-C210.
(3) B. R. Hawke, et al. (1985) LPS XVI, 329-330.
(4) C.M. Pieters (1986) Reviews of Geophysics 24, 557-578.
(5) P.D. Spudis, et al. (1989) PLPSC 19, in press.
(6) P.D. Spudis, et al. (1988) PLPSC 18, 155-168.
(7) B.R. Hawke, et al. (1984) LPS XV, 352-353.
(8) P.G. Lucey, et al. (1986) PLPSC 16, D344-D354.
(9) P.G. Lucey and B.R. Hawke (1988) PLPSC 18, 355-363.
(10) B.R. Hawke et al. (1987) NASA-TM-89810, 211-213.
(11) S. Smrekar and C.M. Pieters (1985) Icarus 63, 442-452.