SPECTRAL REFLECTANCE STUDIES OF THE ORIENTALE REGION OF THE MOON: PRELIMINARY RESULTS. B. R. Hawke, E. Cloutis, P. Owensby, P. Lucey, and J.F. Bell, Planet. Geosci. Div., Hi. Inst. of Geophys., Univ. of Hawaii, Honolulu, HI 96822; and P.D. Spudis, Dept. of Geology, Arizona State Univ., Tempe, AZ 85281.

INTRODUCTION: The Orientale impact occurred in rugged highlands on the southwestern limb of the Moon and was the last of the major basin-forming events. Valuable insight concerning lateral and vertical changes in the composition of the lunar crust can be provided by studies of material exposed by lunar impact basins. These impacts have excavated material from a variety of depths and deposited this ejecta in a systematic manner. Hawke et al. (1) recently presented the results of orbital geochemistry and chemical mixing model studies of the Orientale basin region. It was concluded that the Orientale ejecta north of the basin are dominated by anorthositic material and that only very minor amounts of low-K Fra Mauro basalt are present. In addition, no deposits rich in mafic material of possible mantle origin were identified. Unfortunately, Apollo orbital geochemistry data is available only for terrain north of Orientale. In order to investigate the composition of materials exposed on the interior of Orientale basin, we have collected near-infrared reflectance spectra for units within the Cordillera ring. The purpose of this paper is to present the preliminary results of an analysis of these spectra.

METHOD: Twelve near-infrared spectra (0.6-2.5μm) were recently (October, 1983) obtained at the Mauna Kea Observatory 2.2-m telescope using the Planetary Geosciences Division indium antimonide spectrometer. These include spectra obtained for two fresh surfaces on the inner Rook ring, two fresh craters in the outer Rook Mts. (Eichstadt K, 13-km. in diameter and an unnamed 15-km. crater), and two fresh 11-km. craters (Eichstadt G and H) which are located between the outer Rook ring and the Cordillera ring and expose material from within the knobby facies of the Montes Rook Formation (2) [domical facies of Head (3)]. In addition, spectra were collected for portions of the Maunder Formation (2) which is restricted to the central part of Orientale basin within the Montes Rook ring as well as for portions of Lacus Veris and Lacus Autumni. Extinction corrections were made using the techniques described by McCord and Clark (4). Analyses of absorption bands and continuum slopes were made using the methods presented by McCord et al. (5).

RESULTS AND DISCUSSION: Analyses of the spectra obtained for the mare units on the interior of Orientale (Lacus Veris and Lacus Autumni) indicate that these surfaces are contaminated by variable amounts of local highland debris. This is not surprising in light of the limited areal extent of the mare units and the proximity of highland terrain. However, the presence of a highlands component complicates comparisons with spectra of common nearside mare deposits. The contributions of highlands debris will have to be subtracted by means of spectral mixing models before additional progress can be made.

Spectra obtained for mature highlands units on the interior of Orientale basin (e.g., Maunder Formation) are very similar to those of mature units in the vicinity of the Apollo 16 landing site. A similar composition is implied. These results are consistent with those of recent orbital geochemistry studies (6-8).

Special attention was paid to the spectra collected for five fresh craters on the Orientale interior. Eichstadt G and H should be dominated by the material which comprises the knobby facies of the Montes Rook Formation. Eichstadt K and an unnamed crater in the outer Rook Mts. should expose the major components of the third Orientale ring. The spectra for knobby facies and the outer Rook Mts., while differing in detail, exhibit many common spectral characteristics. All represent highlands rocks with abundant Fe-bearing plagioclase feldspar and Ca-poor pyroxene. A mixture of noritic anorthosite and anorthositic norite is indicated. There is no evidence for the presence of an ultra-mafic component.

The spectrum of a small crater in the inner Rook ring proved to be very different. Only very weak pyroxene bands are present and no well-defined plagioclase band is seen. We suggest that at least this portion of the inner Rook Mts. is dominated by plagioclase feldspars which have been subjected to shock pressures of ~200 kb (9,10). There is no evidence for the presence of mantle material in the inner Rook ring.

REFERENCES: 1) B. Hawke et al. (1982) LPS XIII, 306; 2) D. Scott et al. (1977) USGS Map I-1034; 3) J. Head (1974) The Moon, 11, 327; 4) T. McCord and R. Clark (1979) Pub. A.S.P., 91, 571; 5) T. McCord et al. (1981) JGR, 86, 10833; 6) A. Metzger et al. (1981) PLPSC, 12B, 751; 7) C. Andre and F. El-Baz (1981) PLPSC, 12B, 767; 8) P. Spudis (1982) Ph.D. dissertation, Ariz. State Univ.; 9) J. Adams et al. (1979) LPS, X, 1; 10) E. Bruckenthal and C. Pieters (1984) LPS, XV, (this volume).