

SUGGESTED MODEL HISTORY OF THE MOON

By

Harold C. Urey, Kurt Marti, Mei-Kao Liu, James W. Hawkins

Abstract

A number of very interesting and important observational lunar data have been secured, namely, the mascons, the negative anomalies in Ptolemaeus and Albategnius, the chemical compositions of highlands and maria, the ages of the soils and rocks and the seismic observations. We have attempted a tentative model to account for all these data. (1) The moon accumulated at sufficiently low temperatures to permit the support of the mascons even with subsequent radioactive heating. (2) It was melted superficially 4.6 - 4.7 aeons ago. (3) The surface differentiated into anorthosite, titaniferous basalt and "dunite" layers sufficiently rigid to support the general family of craters. (4) Its interior has been sufficiently rigid to support the mascons for 4.6 aeons. (5) During the great collisions that produced the maria, ash-like flows were produced from the liquid titaniferous basaltic layer to produce the smooth flooded maria and the deep but variable regolith which can account for the seismic data. (6) These dust layers of titaniferous basalt were sufficiently insulating and had sufficient radioactive isotopes to produce local remelting approximately 3.5 aeons ago, and, hence, produced the rocks of Apollos 11 and 12. (7) The titaniferous liquid layer might have supplied the liquid required to produce Van Dorn's "mud", and hence the ring structures of the maria, especially of Mare Orientale. (8) The regolith at Apollo 11 site has remained a closed system since its formation about 4.6 aeons ago, with the exception of the addition of some surface-transported material.