

## **Finding Missing Pages of Earth History on the Moon**

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The Chicxulub impact event at the K/T boundary demonstrates that impact cratering can affect the biologic evolution of Earth by causing a mass extinction and subsequent radiation. The record of these processes is fragmentary on Earth, however, because other geologic processes recycle the Earth's crust and consume the evidence.

In contrast, the Apollo program suggested the Moon can provide a unique window into Earth's past and, thus, that the new lunar exploration initiative will continue to provide an otherwise unobtainable view of the geologic and biologic evolution of Earth.

A particularly important legacy of Apollo is the lunar cataclysm hypothesis, which suggests the Earth suffered an intense bombardment ~3.9 Ga, nearly coincident with the age of the earliest traces of life. To better determine if impact cratering was involved in the origin and early evolution of life, we need a collection of lunar impact melts tied to large craters and basins. These samples will provide a measure of the flux and type of impactors, which will, in turn, permit an analysis of the delivery of biogenic elements during, and the environmental consequences of, the bombardment.

Analyses of lunar impact melts will also provide the data needed to determine the average post-bombardment flux and determine if there were particularly intense storms of impact activity, hints of which occur in the Archean, 800 Ma, and 500 Ma. This same record will provide the tools necessary to better assess the hazards that impact cratering poses for Earth today and in the future.