

An Economic Rationale for Lunar Mineral Exploration
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ABSTRACT

Exploration of space is increasingly being rationalized by the potential for long-term commercial payoffs. The commercial use of lunar resources is gaining relevance as technology and infrastructure increase, yet determination of economic feasibility depends on an adequate foundation of geological information. While past lunar exploration has provided detailed knowledge about the composition, geologic history and structural characteristics of the lunar surface at six locations, the rest of the Moon remains largely unexplored. The purpose of this paper is to describe traditional methods and decision criteria used in the mineral exploration business and apply them to a case study of lunar resource utilization in an effort to provide a basis for lunar exploration.

Rationale for terrestrial mineral exploration is firmly entrenched within the context of economic gain, with asset valuation forming the primary feedback to decision making. The paper presents a summary of relevant knowledge from the field of exploration economics, applying it to a model of lunar propellant mining developed in 2002 for the NASA Exploration Team (NExT). It includes a description of the current paradigm of both space exploration and terrestrial mineral exploration, as each pertains to setting priorities and decision-making. It briefly examines issues related to space resource demand, extraction and transportation to establish its relevance.