Paper ID: 12680
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The Human Space Exploration Value Proposition (07)
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WHY GO? ASSESSING THE EVIDENCE FOR BENEFIT FROM SPACE EXPLORATION

Abstract

Space exploration has always been under scrutiny from decision makers assessing whether exploration represents value for money. Securing continued funding for space exploration depends on a robust and reasoned explanation of exploration's value proposition. To assess value, both the benefits and costs of exploration need to be analysed. This paper however focuses only on the benefit facet. It presents a review and analysis of the diverse benefits claimed from space exploration in order to add clarity and transparency to the debate around exploration value. Our review of rationales for exploration showed only a cursory examination of the benefits claimed from space exploration, whether robotic or human. Still scarcer was rigorous quantitative or qualitative evidence to support the causal link between exploration and benefit. In most cases, the rationale for exploration formed introductory material to policy or architectural discussion about how to explore, which adversely affected the perceived neutrality of the rationale. This paper consolidates the rationales presented in over 100 scientific journal articles, government-commissioned reviews, space agency studies and articles in trade magazines and the popular press over the past 50 years. The cited benefits are decomposed by theme and include employment, national prestige, incentives for education, research spinoffs, military advantage, human curiosity and access to new resources. For each of the claimed benefits, the evidence linking space exploration to that benefit is assessed on a five-point scale. The assessment is conducted separately for human and robotic exploration, and also notes where specific exploration destinations or activities are necessary to realize a particular benefit. The paper concludes that the paucity of evidence generally for the benefits of space exploration represents a fundamental barrier to fiscally responsible allocation of funds to space exploration. Additionally, some benefits are much better supported by evidence than others, though those well supported by evidence are insufficient to justify cost-benefit ratios. The paper recommends funding ongoing studies which rigorously evaluate the benefit of space exploration as a cost-effective and fundamental step for the global space exploration community to demonstrate value and achieve sustainability.