

Space Studies of the Earth-Moon System, Planets, and Small Bodies of the Solar System (B)
Forward Planning for the Robotic Exploration of Mars (B4.2)

SCIENCE CAN BE A POWERFUL GUIDESTAR FOR HUMAN SPACEFLIGHT

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The Planetary Society, in its report *Humans Orbiting Mars: A Critical Step Toward the Red Planet* (<http://hom.planetary.org>), recommended incorporating the goals of the scientific community starting from the earliest planning stages of NASA's future Mars exploration architecture. Here, we expand upon that recommendation and reinforce the fact that whether the evolving plan takes us directly to Mars, or first to the Moon and then eventually on to Mars, there will still be critical roles for science in the advocacy, planning, conduct, and ultimate success of that plan.

NASA frequently uses scientific discovery as a justification for national investment in human spaceflight, even though science has generally been given a relatively low priority in both mission planning and operations (*e.g.*, in the planning of Apollo and the ISS). Concomitantly, much of the scientific community rarely discusses the potential utility (or even necessity) for astronauts in addressing the most pressing space science questions. There is a large community of lunar and Martian scientists, in particular, that could serve as a cornerstone of support within any coalition for the human exploration of the Moon and Mars, but this support is not a given, and at times is not even specifically sought out.

As NASA plans to potentially return astronauts to the Moon and engages in long-term planning for humans to Mars, we believe that science should be more openly used as one of the guiding forces in defining the goals of these endeavors, and that the scientific community should be more explicitly integrated in mission planning from the very earliest stages. Via the recent Planetary Decadal Survey and ongoing studies by groups like MEPAG and LEAG, the scientific community has already defined its top priority scientific goals for the Moon and Mars, and these goals can serve as helpful constraints when working to coalesce a broad coalition to support a focused program of human spaceflight. Indeed, the most recent Decadal did begin to explore the important ways that human exploration can contribute meaningfully to scientific advances. Such analyses will hopefully be expanded and amplified in the next Decadal.

Science should not be treated as an afterthought in human exploration missions, nor should science budgets compete with (and lose to) those for human exploration. Rather, NASA and the science community should focus the science objectives of human missions on areas best served by humans, rather than areas where robotic assets have proven capable and adequate. NASA can make significant steps toward this goal by providing focused research funding for the scientific community to study these opportunities, and by establishing cross-directorate planning committees between HEOMD and SMD that provide funding for scientific participation.