



Possible Strategies to Optimize Science Return from Martian Samples for the International Scientific Community: Science in Containment

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Introduction

The MSR Science Planning Group (MSPG) has been established by NASA and ESA to help develop a stable foundation for international scientific cooperation for the purposes of returning and analyzing samples from Mars. MSPG's approach is to formulate and propose mechanisms through which the international scientific community can achieve our shared scientific objectives.

A series of workshops has been scheduled to facilitate the development of a mutually acceptable set of science-driven functional requirements for the handling and analysis of martian samples. The objective of the MSPG workshop series is to establish and document positions amongst a diverse set of sample scientists related to planning assumptions and/or potential requirements involving the handling and analyses of returned samples.

The first workshop, "Science in Containment," took place in January, 2019. Planning for the second and third workshops (tentatively titled "Contamination Control," and "Reconciling Planetary Protection and Science Requirements," respectively) is underway. Each workshop is expected to result in a written report which could inform future planning for sample receiving and analysis. Community feedback will also be solicited as a part of this process. Here we present findings from Workshop #1.

Workshop #1: Science in Containment

The scope of this workshop was the formulation of strategies for initial assessment and for determination of the scientific investigations that would potentially need to take place in containment. Workshop attendees included members of the MSPG and invited scientists specializing in relevant disciplines including petrology, astrobiology, organic geochemistry, cosmochemistry, geochronology and curation.

The workshop included introductory talks on relevant topics including the science objectives for returned Mars samples, potential engineering considerations, perspectives from the handling of the Apollo lunar samples and Mars meteorite samples, potential synchrotron techniques for imaging unopened samples, potential sterilization techniques which might have to be employed for planetary protection reasons, etc.

These introductory talks were followed up by the formation of breakout groups to discuss topics related to two main topics. The first of these was the initial assessment/preliminary examination of the samples. Examples of questions addressed in this breakout session include:

- What initial data needs to be collected on each sample type in order to make sample management decisions such as: sample sub-division strategies, sub-sampling for planetary protection purposes, or sample allocation to science Principal Investigator-led investigations?
- How large should the science team responsible for initial assessment be, how should it be led/organized, and how should its members interact with each other (potentially by remote means), as the samples are progressively made available?

The second breakout session was focused around PI-led science within containment vs. outside of containment. The set of assumptions here was that measurements that are either time or sterilization sensitive (or both) may need to be planned for inside of containment. Questions addressed during this breakout session included:

- What is the list of time and sterilization sensitive measurements to be considered?
- What are the implications for facilities given that the identified measurements may need to be made in containment?