

STRATEGIES FOR OPTIMIZING THE SCIENTIFIC INTERACTIONS WITH RETURNED 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 setting a science strategy for the analysis of returned 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 in order to facilitate the development of a mutually acceptable set of science-driven functional requirements for the handling and analysis of samples returned from Mars. 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. Community feedback will also be solicited as a part of this process.

The first workshop, "Science in Containment," took place on January 14-16th, 2019 in Columbia, MD. Planning for the second and third workshops (tentatively titled "Contamination Control," and "Reconciling Planetary Protection and Science Requirements," respectively) is currently underway. Each workshop is expected to result in a written report which could inform future planning for sample receiving and analysis. 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 (i.e., preliminary examination) and determination of the scientific investigations that would potentially need to take place in containment. Workshop attendees included members of the MSPG as well as invited scientists specializing in relevant disciplines including petrology, astrobiology, organic geochemistry, cosmochemistry, geochronology and sample curation.

The structure of the workshop include introductory and overview 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 and potential sterilization techniques

which might have to be employed for planetary protection reasons.

These introductory talks were followed up by breakout sessions to discuss topics related to two main areas. The first of these was the initial assessment/preliminary examination of the samples. Questions discussed in this breakout session included the following:

- What initial data needs to be collected on each sample type in order to make sample management decisions like sample sub-division strategies, sub-sampling for planetary protection (PP) purposes, sample allocation to science Principal Investigators (PIs), and others?
- What should the optimal size and composition of the science team responsible for the 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 versus outside of containment. The set of assumptions for science here was that measurements that are either time or sterilization sensitive (or both) may need to be planned for inside of containment. Topics discussed during this breakout session included:

- What is the list of time and sterilization sensitive measurements to be considered?
- What are the facility implications if these measurements need to be made in containment?

The findings developed through this process are being compiled into a workshop report which could be used to inform future planning for returned martian samples.

Disclaimer: The decision to implement Mars Sample Return will not be finalized until NASA's completion of the National Environmental Policy Act (NEPA) process. This document is being made available for information purposes only.