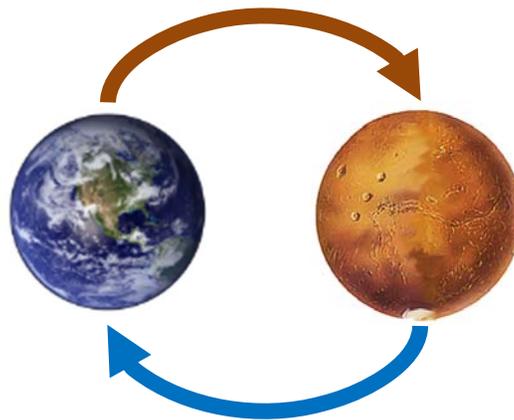


**Process for Developing
Organic Contamination Limits
Associated with
Mars Sample Caching and Return**



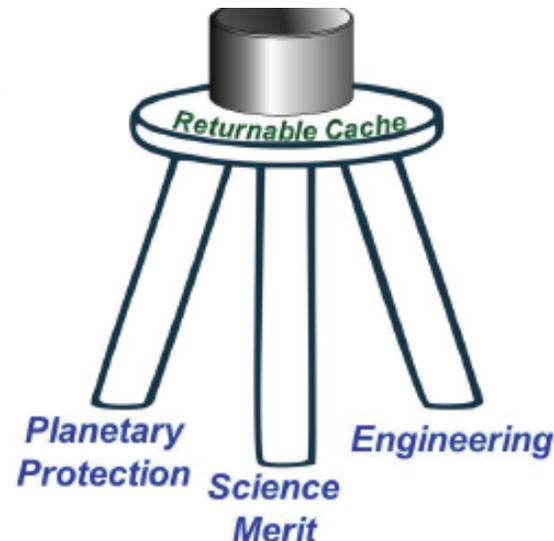
**Dr. Cassie Conley/SMD, Office of Planetary Protection
Dr. Betsy Pugel/Detailee to SMD from GSFC
May 20, 2014**

Planetary Protection Policy Primer for Mars 2020 (1/4)

From the Mars 2020 SDT (July 2013):

Three attributes are essential to making a cache returnable.

- 
- 1** The cache has enough scientific value to merit returning.
 - 2** The cache complies with planetary protection requirements.
 - 3** The cache is returnable in an engineering sense.



Compliance with PP Requirements is at two levels:

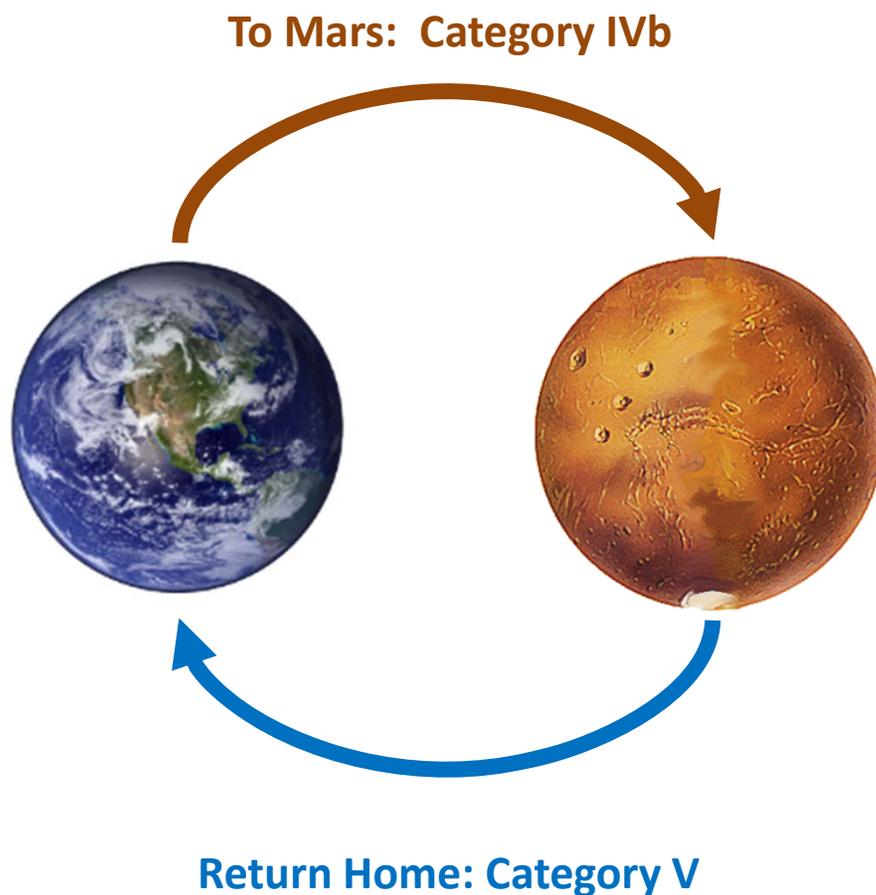
- Policy Levels: COSPAR PP Policy and NASA NPD 8020.7G and NPR 8020.12D
- Mission Legs: Outbound and Return

Planetary Protection Policy Primer for Mars 2020 (2/4)

Parent Policy - COSPAR 2011

Outbound leg of sample return must be Cat IVb

“This provision is intended to avoid “false-positive” indications in a life-detection and hazard-determination protocol or in the search for life in the sample after it is returned.”



Return Leg must be Cat V

“The highest degree of concern is expressed “

- Protection of humans from Martian biohazards
- Protection of Martian science from human biohazards



Planetary Protection Policy Primer for Mars 2020 (3/4)

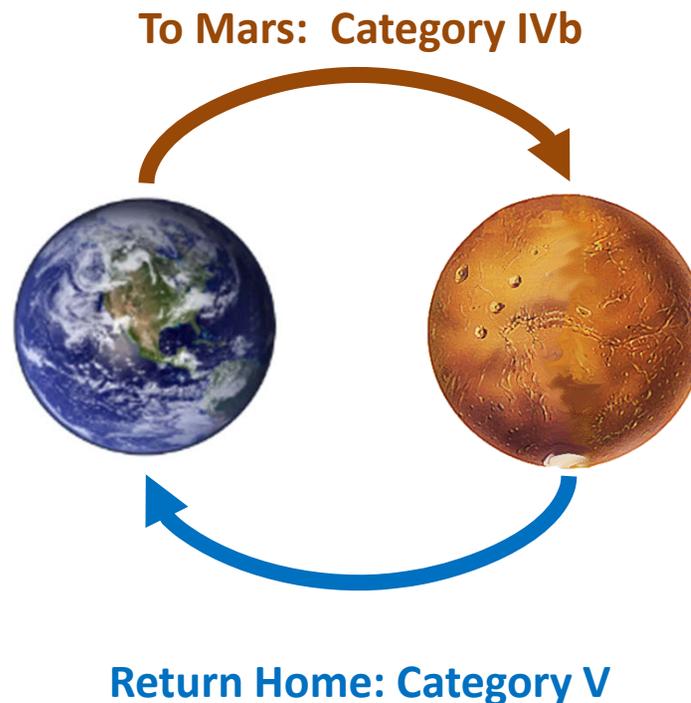
NASA - NPR 8020.12D

Mars - Section 5.3

Section 5.3.2.2: Cat IV b Requirements *(choose one)*

- (1) Blanket biological burden level: 30 spores
- (2) Payload instrumentation drives bioburden level
- (3) Sample acquisition, delivery, analysis methods sterilized to (1) or to (2) and protected from recontamination

Provision for false positive minimization



Section 5.3.3: Cat V Requirements

Similar language to
COSPAR PP Policy

“For unsterilized samples returned to Earth, a program of life detection and biohazard testing or a proven sterilization process, shall be undertaken as an absolute precondition for the controlled distribution of any portion of the sample”

Planetary Protection Policy Primer for Mars 2020 (4/4)

NASA - NPR 8020.12D

Section 2- General Mission Requirements

To demonstrate that a project is meeting PP requirements, a project must provide:

Outbound Leg, Cat IVb

NPR 8020.12, Section 2.7.3.3

Contamination Analysis Plan:

- *Potential Contaminating Sources*
- *Contamination Sources Analysis*
- *Assumptions*

Return Leg, Cat V

NPR 8020.12 D, Section 2.7.4.1

Earth Safety Analysis Plan:

- *Potential Contaminating Sources*
- *Probability of Contamination Model*
- *Contamination Sources Analysis*
- *Substantiation of Parameter Values*

- Prior missions (e.g. MSL) have developed Contamination Analysis Plans
- The difference now: The connection between the contamination on the Outbound Leg and its linkages to the Return Leg

There is a need for a PP organic contamination requirement on the outbound leg of the mission in addition to the requirement for microbial cleanliness.

A PP organic contamination requirement is necessary in order to:

- **Accurately identify and characterize Level of Risk associated with Potential Contaminating Sources & the Probability of Contamination upon return**
- **Reliably execute the Life Detection and Biohazard Protocol**

Process –

