

# Science/PP Interface Issues For Mars Sample Return (MSR)

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Jan. 20, 2010

*Pre-decisional: for discussion purposes only*

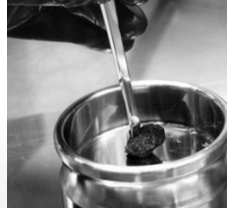


THE MSR CAMPAIGN



# MSR Planning Topics

## Common Interests for PP & Science



Many MSR-related planning questions are separately of interest to PP and “science”.

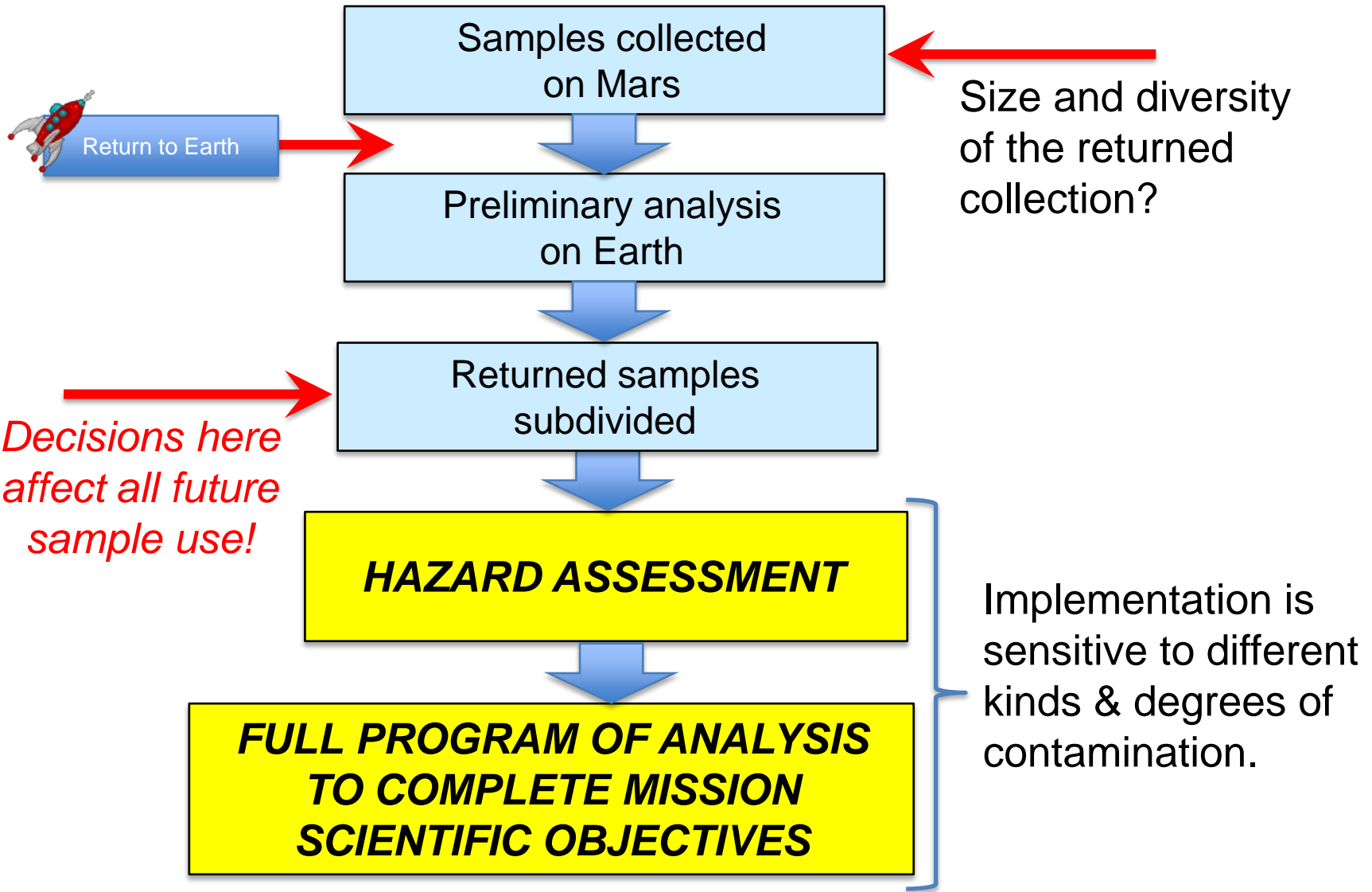
However, some are of **mutual interest**:

1. **Some** contamination control aspects
2. **Initial subdivision** of returned samples
3. **Size and diversity** of the returned collection
4. Other?

*Ultimately, the mission can only be designed and operated around a **single set of requirements**.*

*How can we ensure that both interests are served?*

# Returned Sample Flow Overview



# Contamination: Critical Questions

## *Questions for Science Planning:*

- ✧ How do different levels of sample contamination affect **ability to achieve scientific objectives**?

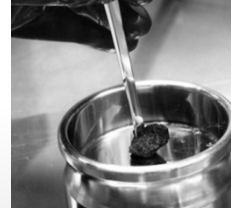
## *Question for PP Planning:*

- ✧ What are the effects of different sample contamination levels on **determination of returned sample hazard potential**?

## *Engineering Consequences of Above:*

- ✧ What **contamination control requirements** during returned sample analysis should be adopted by the MSR campaign?
- ✧ How should they be **applied to MSR's** various primary systems?
- ✧ What overall mission contamination control requirements must be implemented?

# Possible Overlapping Contamination-related Interests



**SCIENCE**

**JOINT**

**PP**

**Contamination of the landing site**

Special regions

Live Earth microbes to Mars, protect sites of scientific interest

**Contamination of the returned samples**

Inorganic contaminants on RS

Test for indigenous extant life in the RS

Are RS hazardous?

Organic contaminants on RS

Live Earth microbes on RS

Dead Earth microbes on RS

**Other**

Observation of dead Martian biomaterial

Implications for future PP policy

Ethical issues



# Sample Subdivision

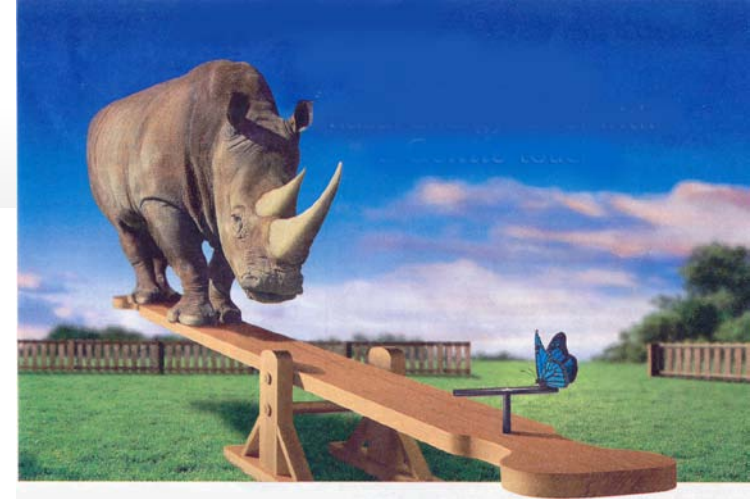
Maximize diversity for Science!

*“but is that harder to test for biohazards”?*

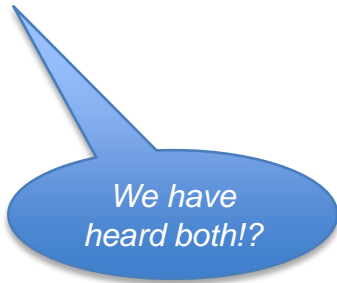
Maximize subsample **uniformity** for PP???

OR

Maximize subsample **diversity** for PP???



*Science must be balanced with Planetary Protection*



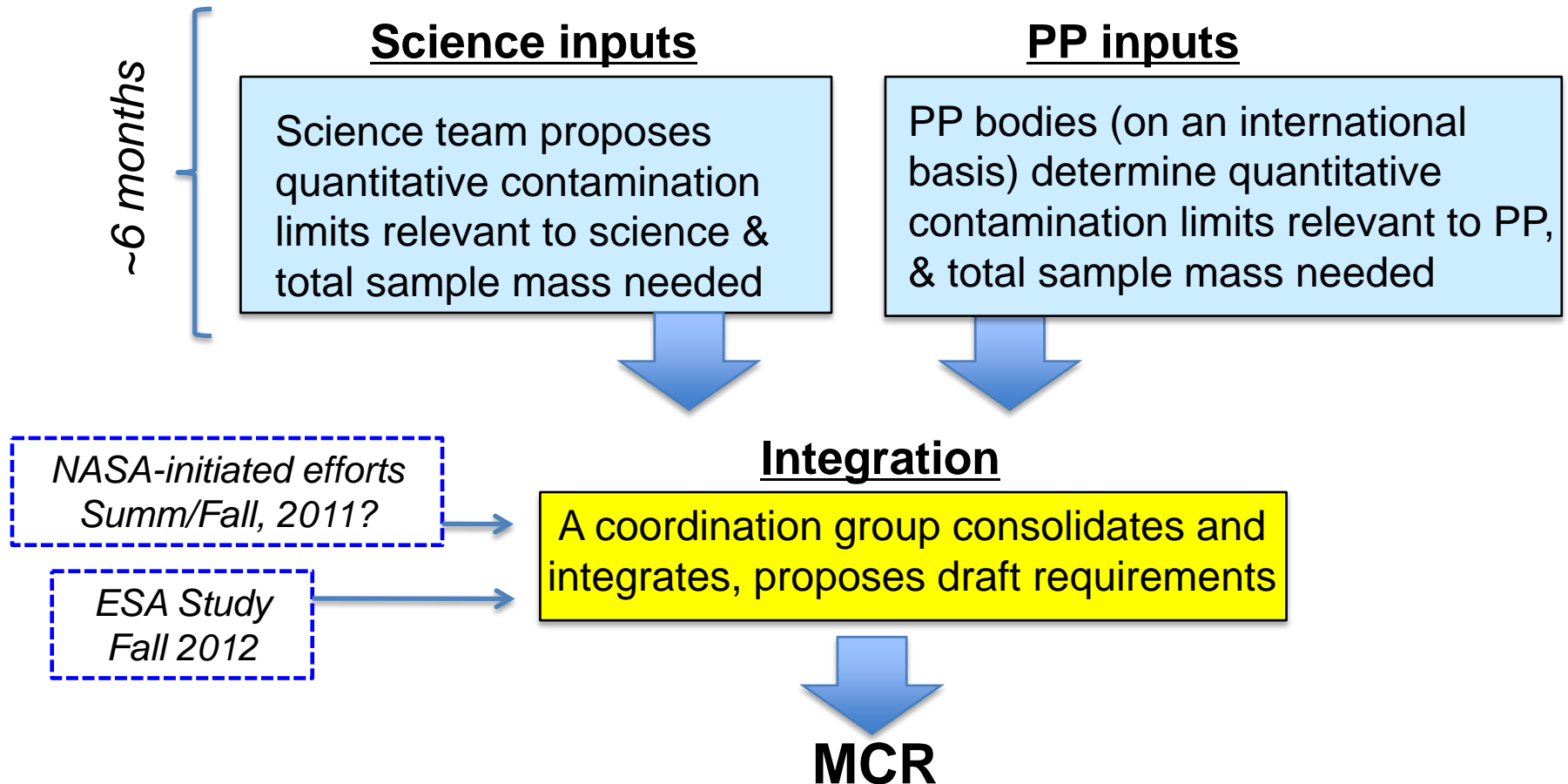
## Balance Issues

- 1) *Samples must be subdivided....*
- 2) *Sample diversity vs total mass?*
- 3) *Statistically significant subsamples?*
- 4) *Destructive and nondestructive testing?*
- 5) *Sacrificial samples?*
- 6) *Well-mixed vs. discrete materials?*

# A call for action!

NASA's 2018 sample caching mission:

- *Mission Concept Review (MCR) scheduled for ~Feb. 2012*
- *Announcement of Opportunity (AO) scheduled for ~May, 2012*
- *System Requirements Review (SRR) for ~Feb. 2013*



# Acronyms

- PP Planetary Protection
- MSR Mars Return Sample
- MEPAG Mars Exploration Program Analysis Group
- E2E-iSAG End-to-End International Science Analysis Group
- RS Returned Samples
- NASA National Aeronautics and Space Administration
- MCR Mission Concept Review
- AO Announcement of Opportunity
- SRR System Requirements Review
- ESA European Space Agency