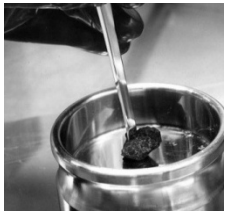
Goals for this Meeting: Day 1 Day 2

- Update the community on progress in the exploration of Mars, including NASA and the European Space Agency (missions that are currently operating, in preparation, or planned)
- Discuss Decadal Survey results and MEPAG response
- Listen and provide input to report of Mars Sample Return End-to-end International SAG (E2E-iSAG)
- Evaluate landing site selection process proposed for MSR
- Initiate activities by MEPAG to develop positions and inputs to future Mars exploration activities

E2E Overview



Prioritized MSR science objectives

Derived implications

- Samples required/desired to meet objectives
- Measurements on Earth

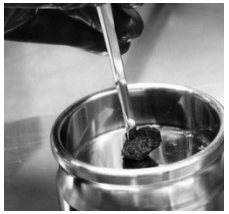
Critical Science Planning Questions for 2018

- Variations of interest?
- # of samples?
- Types of landing sites that best support the objectives?
- Sample size?
- Measurements needed to interpret & document geology and select samples?
- On-Mars strategies ?

Engineering implications

- Sampling hardware
- Instruments on sampling rover
- EDL & mobility parameters, lifetime, ops scenario
- Sample preservation

Objectives and samples required/desired



Scientific Objectives in Priority Order

1	Critically assess any evidence for past life or its chemical precursors, and place detailed constraints on the past habitability and the potential for preservation of the signs of life
2	Quantitatively constrain the age, context and processes of accretion, early differentiation and magmatic and magnetic history of Mars.
3	Reconstruct the history of surface and near-surface processes involving water.
4	Constrain the magnitude, nature, timing, and origin of past planet-wide climate change.
5	Assess potential environmental hazards to future human exploration.
6	Assess the history and significance of surface modifying processes, including, but not limited to: impact, photochemical, volcanic, and aeolian.
7	Constrain the origin and evolution of the martian atmosphere, accounting for its elemental and isotopic composition with all inert species.
8	Evaluate potential critical resources for future human explorers.

Mandatory: Determine if the surface and near-surface materials contain evidence of extant life

Sample Types in Priority Order

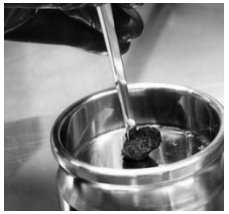
1A. Subaqueous or hydrothermal sediments (EQUAL PRIORITY)
1B. Hydrothermally altered rocks or Low-T fluid-altered rocks

2. Unaltered Igneous rocks

3. Regolith

4. Atmosphere, rocks with trapped atmosphere

E2E-SAG: Summary of Really **BIG MESSAGES**



MSR should address 8 major, community-developed science objectives. The most important objective by far relates to determining whether evidence of past life or prebiotic chemistry exists in the examined materials.

To answer the complex questions associated with the highest priority objectives (1-4 on previous slide) would require sample suites that are carefully selected through a process of comprehensive *in situ* science that also provides critical context for sample analyses back on Earth.

The total number of samples that would be needed to address the objectives is 30-40. The approximate mass per rock sample needed for analyses on Earth would be 14-16 g.

There are multiple potential landing sites on Mars where it appears possible to meet the proposed MSR science objectives. To access these sites and sample the desired rocks, the proposed mission may need to be able to tolerate some hazards in the landing ellipse (OR have an ellipse small enough to avoid the hazards) AND be able to traverse beyond the ellipse.

In order to achieve the *in situ* science and assemble the necessary sample suites, the 2018 rover should have the field exploration capabilities defined by the E2E-iSAG

Meeting Outcomes - Draft

*Many first time attendees from Europe; many & diverse reports from the ESA-NASA Joint Mars program.

*MEPAG endorses the joint ESA-NASA proposed missions, which integrate NASA MEP and ESA ExoMars objectives.

*The 2016 Trace Gas Orbiter with EDM appears to be moving ahead.

*The 2018 JSWG and JEWG appear to on the right track to produce a 2018 mission deploying a single rover to achieve both the ExoMars *in situ* astrobiological investigations and the NASA caching science activities.

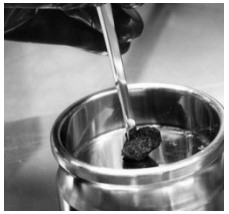
*MEPAG endorses the joint study of a single rover mission, as a means to realize the ExoMars and DS scientific goals while staying within the resource and technical envelopes.

*MEPAG endorses the preliminary conclusions & findings of the E2E iSAG. At the meeting no major objections were raised regarding the general findings, although the community can respond with comments and concerns via email as the iSAG prepares its final report.

*MEPAG encourages the JSWG to begin the science definition activity for 2018 soon; the JSWG should begin with the direction from the E2E iSAG.

*MEPAG will likely want to follow up the E2E activity with other SAGs, once the agencies have agreed on the general 2018 joint rover mission design.

Recommendations for Future Work
(1 of 2)



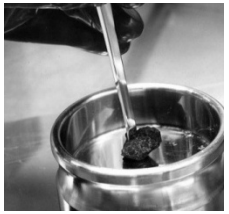
Potential MEPAG-related Tasks

1. Considering the prioritized MSR objectives, determine the sample contamination issues that would affect the scientific measurements to be made on Earth (parts of this should be worked jointly with PP, CAPTEM, NAI, other).
    a. *Determine contamination control standards for the sample contact chain, including both the part in the flight system and the part in MRSH.*
    b. *Determine positive and negative control standards, and where they need to be introduced into the sample chain, in order to defend the discoveries we are seeking to make.*
2. Evaluate and develop life detection investigation & measurement strategies to be carried out on the returned samples (worked jointly with PP).

Program-level issues (NASA and ESA)

3. As aggressively as possible, conduct a landing site qualification and prioritization process. This is crucially important while MRO is still in service!
4. Determine the approximate depth of regolith sampling required to plan for an eventual human mission to the martian surface.

Recommendations for Future Work
(2 of 2)



Research & Development

R&A Program Work (NASA and ESA)

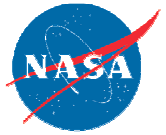
5. General research on reduction of sample mass including:
   - *a. Increased instrument sensitivity*
   - *b. More efficient sample preparation, specifically including polished section manufacture*
   - *c. Use of same material in sequential analyses*
6. Compare ancient hydrothermal/Low-T fluid alteration environments vs. ancient sedimentary environments for prospects of finding signs of ancient life
7. Determine thermal limits for the sample cache and evaluate Mars surface scenarios.

Engineering Development (NASA and ESA)

8. Develop improvements in hazard avoidance capabilities & improved landing accuracy.
9. Enhance rover operations efficiency (e.g. increased autonomy), to optimize productivity within a constrained lifetime.
10. Develop and test drilling capabilities using a library of relevant sample analogues, to ensure adequate drill bit lifetime and sample quality.
11. Optimize end-to-end sample handling to ensure mechanical core integrity until analysis
12. Research, development and testing of sample sealing mechanisms, gaseous transmission rates across seals of different types, and evaluations of seal longevity.

MEPAG Agenda, Day 2

Day 2 – Friday June 17, 2011			
09:00 AM	0:15	Recap of yesterday and goals for today	D. Des Marais
09:15 AM		**Landing sites**	
09:15 AM	0:25	MSL Landing site report/discussion	M. Golombek/J. Grant
09:40 AM	0:15	Report on ESA Landing Site meeting	N. Mangold
09:55 AM	0:15	Proposed NASA/ESA landing site selection process for 2018/MSR	C. Budney/R. Zurek/ J. Vago
10:10 AM	0:20	Discussion	
10:30 AM	0:30	Planetary Protection related to MSR	C. Conley/G. Kminek
11:00 AM	0:15	Break	
11:15 AM		**Other Planning Activity**	
11:15 AM	0:20	GEMS - Geophysical Monitoring Station	B. Banerdt
11:35 AM	0:20	Mars Network Study Overview	A. Chicarro
11:55 AM	0:20	Martian Moon Sample Return study overview	D. Koschny
12:15 PM		**Meeting Reports**	
12:15 PM	0:20	Report from Mars Atmosphere Conference (Paris, February)	F. Forget
12:35 PM	0:25	**Discussion/Future Planning for MEPAG Activities**	D. Des Marais
01:00 PM		Adjourn	



Backup slides

MEPAG Agenda, Day 1

Day 1 – Thursday June 16, 2011			
09:00 AM	0:10	Setting the context: The importance of this as the first International MEPAG meeting	M. Meyer, J. Vago
09:10 AM	0:10	Welcome; Desired Outcomes of this Meeting, Introduction to the Agenda	D. Des Marais, MEPAG Chair
09:20 AM	0:45	NRC Decadal Survey Mars findings and implications	P. Christensen
10:05 AM	0:30	NASA implementation of the Decadal survey	M. Meyer
10:35 AM	0:15	Break	
10:50 AM	1:00	NASA/ESA: State of the Joint Program	D. McCuistion/J. Vago for T. Passvogel
11:50 AM	0:30	Status of NASA led operating and developmental missions	F. Li
12:20 PM	0:30	Status of ESA Mars Express operations and ESA/NASA ExoMars Trace Gas Orbiter development	O. Witasse/M. Allen
12:50 PM	1:30	Lunch	
02:20 PM		**Planning Activity Related to the proposed MSR Campaign**	
02:20 PM	0:05	Report of the MEPAG E2E-iSAG - Introduction	D. Des Marais
02:25 PM	0:30	Scientific objectives of the MSR campaign; kinds of samples, sampling priorities, number of samples needed	M. Sephton
02:55 PM	0:30	Planning for what the science community of the future will do with the samples once received, sample sizing.	M. Grady
03:25 PM	0:25	Reference landing sites on Mars and the potential implications	J. Grant
03:50 PM	0:30	On-Mars measurements, encapsulation, operations scenario, science risks, summary	S. McLennan
04:20 PM	0:15	Break	
04:35 PM	0:25	E2E Panel Discussion	E2E Team
05:00 PM	0:20	2018 objectives from interim Joint Science Working Group (JSWG)	M. Meyer, J. Vago
05:20 PM	0:45	Report from the Joint Engineering Working Group (JEWG)	P. Baglioni/C. Whetsel
06:05 PM	0:25	Day 1 discussion and wrap-up	D. Des Marais
06:30 PM		Adjourn	