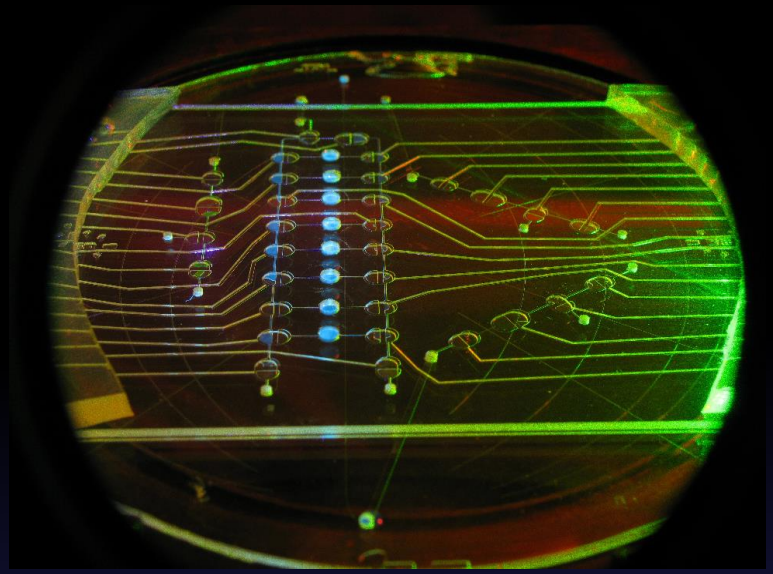
Summary of the 3rd International Workshop on Instrumentation for Planetary Missions



Local Organizing Committee: Drs. Sabrina Feldman, David Beaty, James Ashley, Lindsay Hays, Laura Kerber, & Glenn Sellar

Jet Propulsion Laboratory, California Institute of Technology

MEPAG Meeting #33
February 23, 2017

Pre-decisional: for information and discussion only.

- *Convened October 24-27, 2016 in Pasadena, CA.*
- *Provided a forum for collaboration, team-building, exchange of ideas and information.*
- *195 Engineers, scientists, technologists, and program managers.*

Three Panel Discussions formed a strategic framework for the workshop ~

1. Perspectives on the future of planetary exploration, with five panelists representing MEPAG, VEXAG, OPAG, SBAG, and LEAG.
2. Bridging the gap between planetary scientists and instrument developers.
3. Lessons learned for instrument development from TRL 1-9.

Mars Exploration Program Analysis Group (MEPAG)

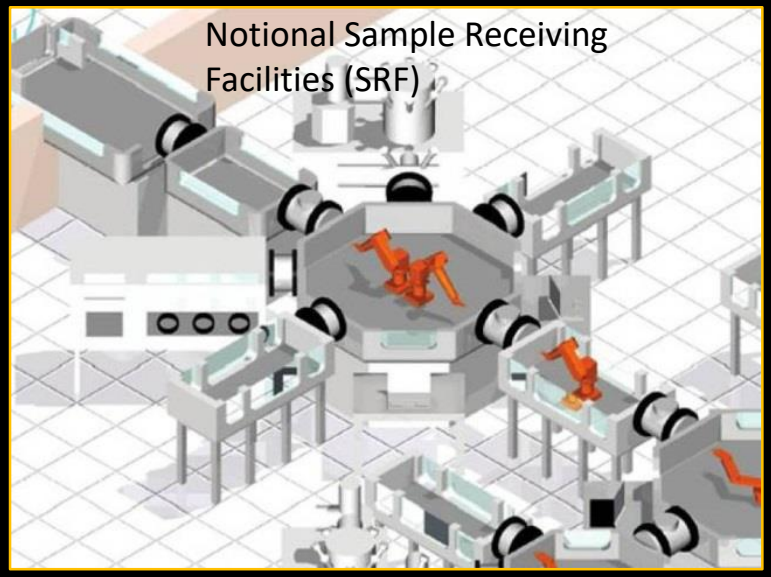
chartered by NASA HQ to assist in planning the scientific exploration of Mars

Perspectives on the Future of Planetary Exploration: The MEPAG Perspective

Dr. Jeffrey R. Johnson, MEPAG Chair
Johns Hopkins University Applied Physics Laboratory

3rd International Workshop on Instrumentation for Planetary Missions
October 24, 2016

Mars has Many Potential Future Opportunities for Instrument Teams...

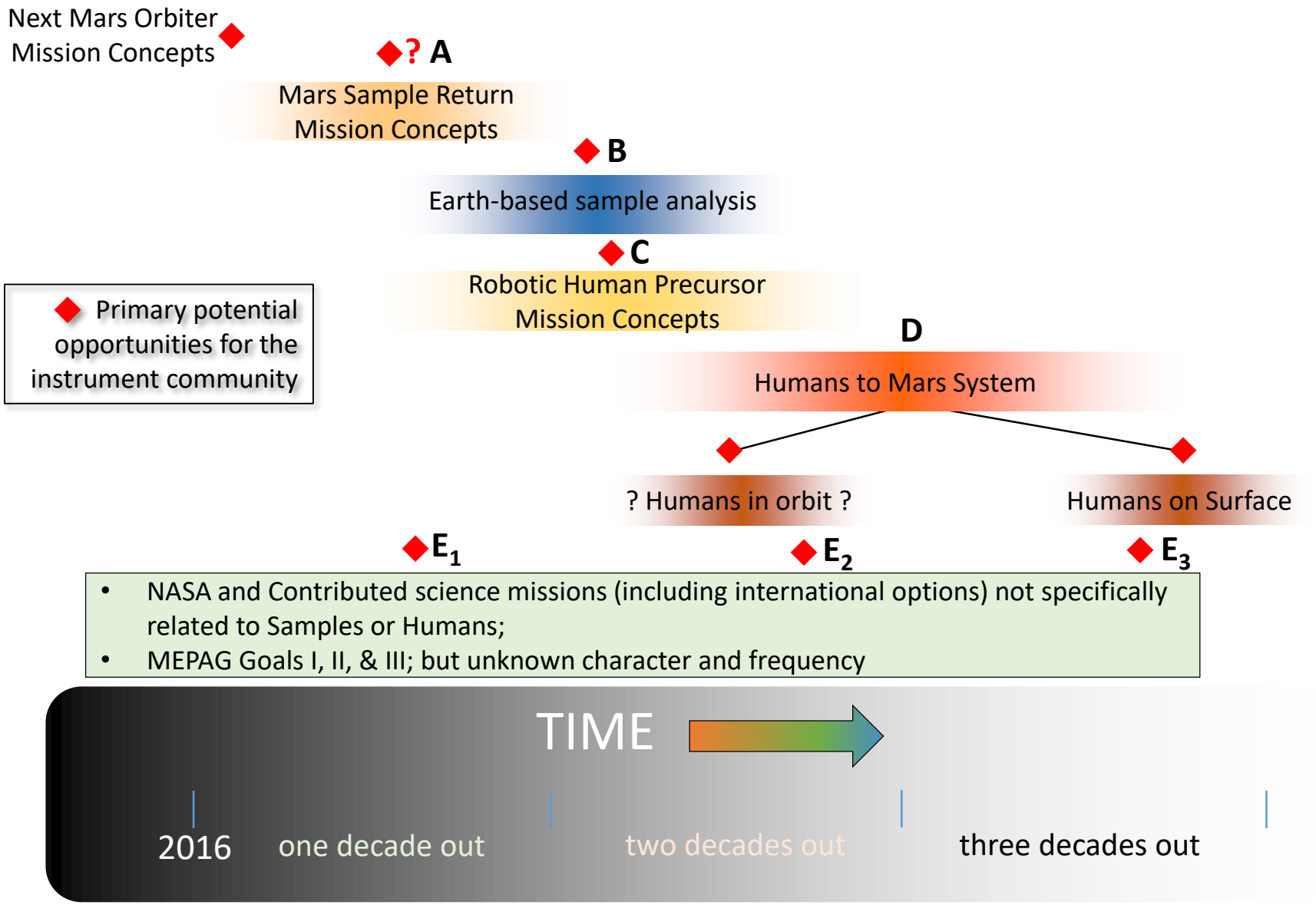


…but what are the science drivers?

MEPAG Goals Document: http://mepag.nasa.gov/reports/MEPAG%20Goals_Document_2015_v18_FINAL.pdf

Life	Climate	Geology	Human Exploration
			
I. Determine if Mars ever supported life	II. Understand the processes and history of climate on Mars	III. Understand the origin and evolution of Mars as a geological system	IV. Prepare for human exploration

Mars has Many Potential Future Opportunities for Instrument Teams



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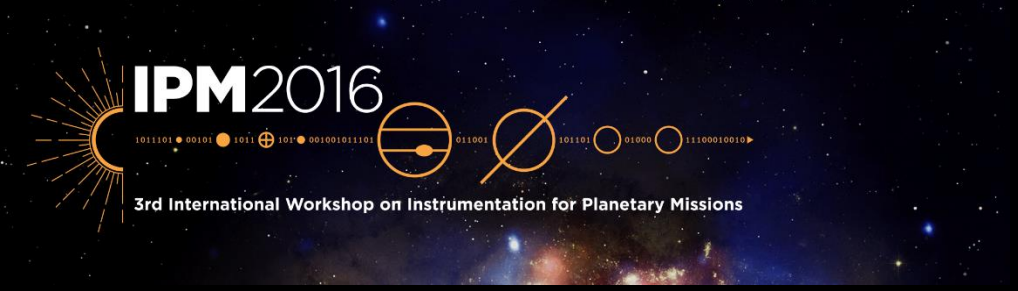


Panel I: Perspectives on the Future of Planetary Exploration - Summary

- Strongly support NASA's PICASSO, MATISSE, COLDTECH, HOTTECH, PSTAR, HOMESTEADER programs to mature future planetary instruments; seek developmental continuity

- Continue to support innovative ways to accomplish science objectives,

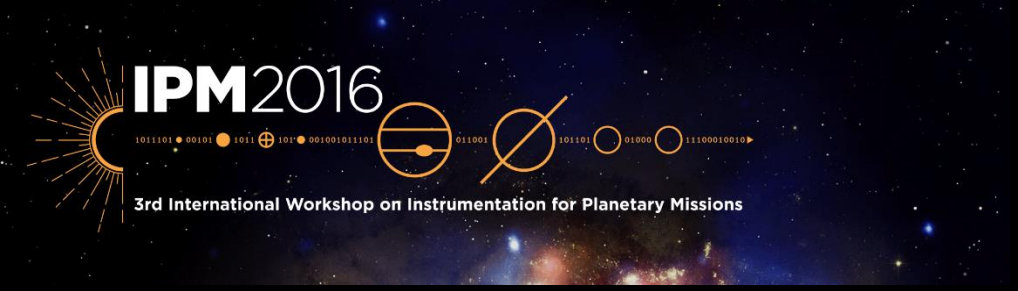
  - ✓ e.g., Cubesat technologies;

  - ✓ Innovations that recognize/address risk, mass, cadence/response times, etc., as well as new types of instrumentation and observation, are encouraged;

  - ✓ This would include efforts to transition advances from cubist technologies to larger missions.

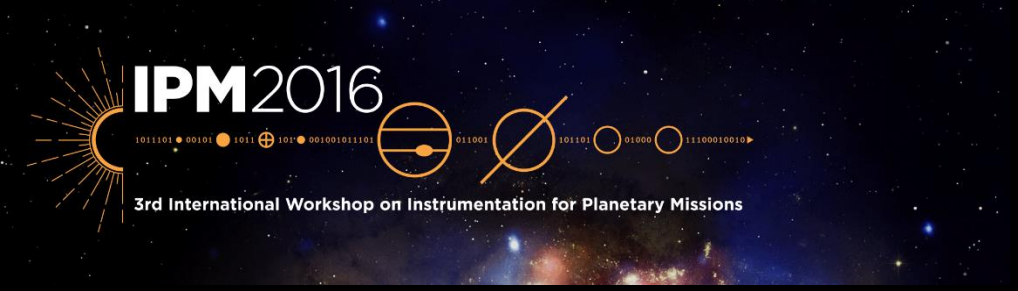
Panel I: Perspectives on the Future of Planetary Exploration - Summary

- AG goals documents identify robust, decades-long science drivers and possible associated opportunities for the instrument community;
- Planetary Instrumentation synergies could provide opportunities:
  - ✓ Sample return (incl. Cryogenic): Mars, Moon, Asteroids/Comets, etc.
  - ✓ In-situ measurements: Mars, Moon, Small bodies
  - ✓ Geophysical instrumentation and deployment: Moon, Asteroids, Outer Planets (Ocean Worlds), Mars?, Venus?
  - ✓ In-situ resource utilization: Moon, Mars, Asteroids
  - ✓ Radionuclear Power Systems & Communications - all destinations.
- Need for involvement of planetary protection early in development of these instruments and mission concepts (PICASSO level).



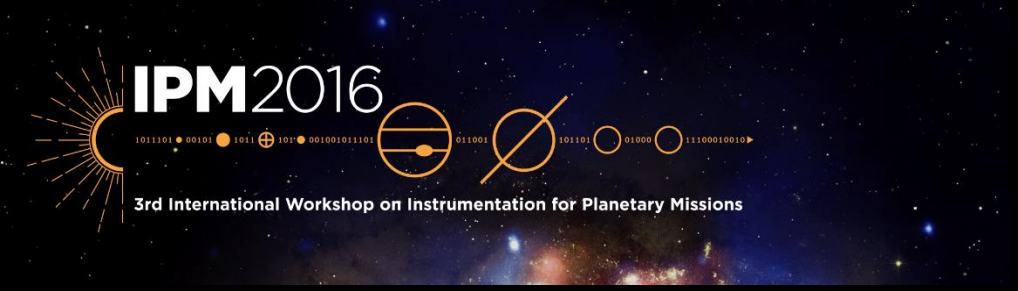
Panel 2: Bridging the Gap between Planetary Scientists and Instrument Developers

- Development (TRL 1-3)
  - ✓ Best instrument proposal teams include both scientists and engineers
  - ✓ Connect at technology meetings (e.g., SPIE), science meetings (AGU, DPS, SCI-X, EPSC, LPSC), and smaller workshops (e.g., KISS)
  - ✓ Consider private industry (e.g., SBIR/STTR) for new capabilities, partnerships



Panel 2: Bridging the Gap between Planetary Scientists and Instrument Developers

- From working prototype to flight (TRL 4-6+)
  - ✓ Incorporate system engineering, data analysis, and operations teams early on
  - ✓ Learn from previous pitfalls, develip workarounds for flight limitations
- Be willing to learn new roles and become fluent in another discipline



Panel 3: Lessons Learned (Takeaway Messages)

- Human Relations!
  - ✓ Putting together the right, multidisciplinary team is crucial
  - ✓ Need a good mix of different experience classes (science, technical, management, etc.)
  - ✓ Collaboration and delegation of roles/responsibilities is key
- No good substitute for experience
  - ✓ Team members needed with both with the parts/techniques/technologies and flight delivery experience
  - ✓ Mentoring programs for next generation of PIs, planetary instrument developers

Panel 3: Lessons Learned (Takeaway Messages)

- Budget time and resources for serious levels of testing and take the results seriously
  - ✓ Reviews
  - ✓ International collaboration is great, but complicated
  - ✓ Technology development and product development are different things
  - ✓ Make good requirements and focus on meeting them
  - ✓ It would be nice to see a technology development flight program for planetary missions, like the sounding rockets (or similar) come back

IPM2016

3rd International Workshop on Instrumentation for Planetary Missions

Follow-up Products can be found on the workshop website, including:

4th IPM: October 2018, Berlin

Workshop Follow-up:

Click here for a summary of key points and take-home messages from the workshop.

Keynote Presentations on Perspectives on the Future of Planetary Exploration ~

Neal C.
The LEAG Perspective
Johnson J.
The MEPAG Perspective
Swindle T.
The SBAG Perspective
Cutts J. A.
The VEXAG Perspective
Simon A.
The OPAG Perspective

Open Source Instrument Database, established by L. Kerber:
www.impdatabase.webnode.com

Summary write-up submitted to and accepted by EOS.