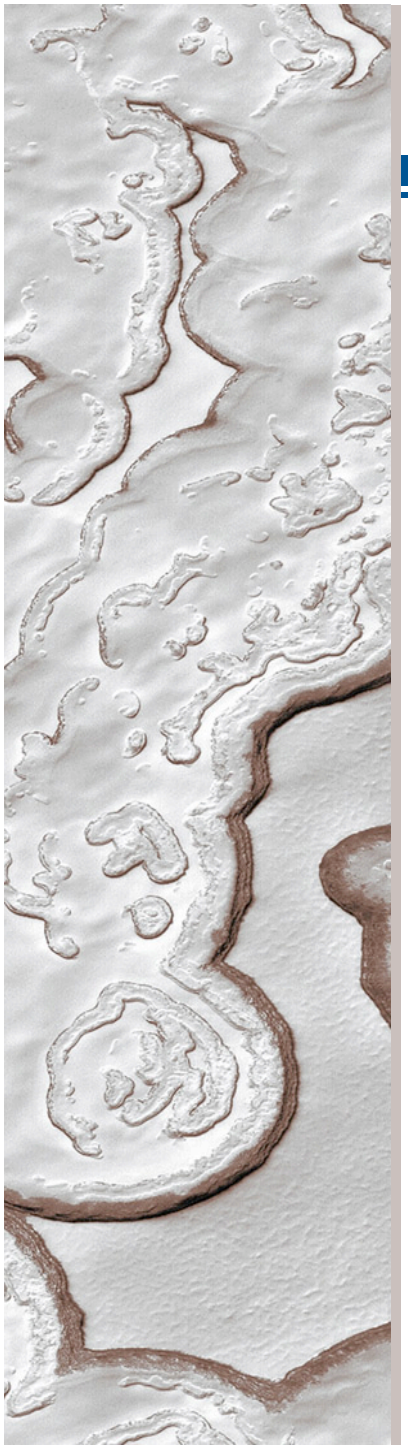

Mission Science Objectives and Science Criteria

Ashwin Vasavada / John Grotzinger

MSL Project Science Office

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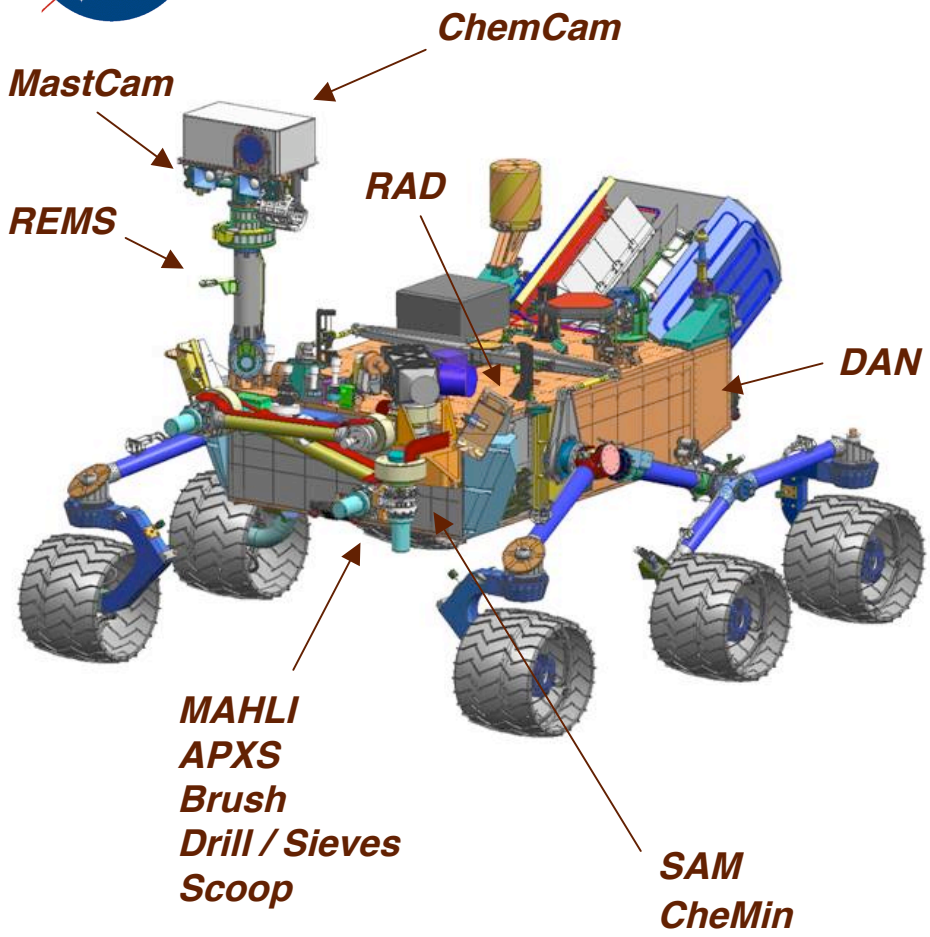
MSL Science Objectives

- The scientific goal of the MSL mission is to explore and quantitatively assess a local region on Mars' surface as a potential habitat for life, past or present
  - Characterize the geology and geochemistry of the region at all appropriate spatial scales
  - Assess biological potential (organics, biosignatures, chemistry)
  - Investigate planetary processes that influence habitability, including the role of water
  - Characterize the broad spectrum of natural radiation

Site Requirements

- A candidate landing site should contain evidence suggestive of a past or present habitable environment. To the extent that it can be determined with existing data, the geological, chemical, and/or biological evidence for habitability should be:
  - preserved for,
  - accessible to, and
  - interpretable by the MSL investigations.
- Must meet or exceed all engineering and safety criteria

Scientific Payload



>130 co-investigators in seven countries

REMOTE SENSING

MastCam (M. Malin, MSSS) - Color stereo imaging, atmospheric opacity

ChemCam (R. Wiens, LANL/CNES) – Chemical composition; remote micro-imaging

CONTACT INSTRUMENTS (ARM)

MAHLI (K. Edgett, MSSS) - Microscopic imaging

APXS (R. Gellert, U. Guelph, Canada) - Chemical composition

ANALYTICAL LABORATORY (ROVER BODY)

SAM (P. Mahaffy, GSFC/CNES) - Chemical and isotopic composition, including organics

CheMin (D. Blake, ARC) - Mineralogy

ENVIRONMENTAL CHARACTERIZATION

REMS (J. Gómez-Elvira, CAB, Spain) - Meteorology / UV

RAD (D. Hassler, SwRI) - High-energy radiation

DAN (I. Mitrofanov, IKI, Russia) - Subsurface hydrogen

Operations Scenarios

- Surface operations scenarios suggest that 6 to 8 sols are required to detect, assess, sample, and analyze each rock and soil sample. When other factors are considered, this cycle can be repeated 50-80 times over the course of the 1 Mars year mission.
- These simulations assume that targets are distributed along a ~10-km traverse.
- The total number of samples analyzed can be traded for traverse distance. Go-To sites that require traversing several km up front would be expected to have exceptional scientific potential.
- Sites at latitudes that experience deep and/or long winters would also be less productive, due to thermal limits on operations, and due to available energy being diverted from nominal operations to providing electrical heating.

Scientific Criteria

- Ability to Assess Biological Potential w/MSL Payload
- Evidence for Habitable Environment (Env. of Formation and Deposition)
  - Aqueous Environment
  - Type of Habitable Environment
- Preservation of Biosignatures (Diagenetic Environment)
  - Organic Material
  - (Pre-) Biotic Materials
  - Biologic Textures
  - Mineralogic Biosignatures
- Ability to Characterize Geology/Geochemistry
  - Context within Geologic Timescale
  - Context within Geologic/Geomorphic/Stratigraphic Setting