Planetary Protection at NASA: Status and Issues

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What is Planetary Protection?

- Preserve planetary conditions for future biological and organic constituent exploration
  – *avoid "forward contamination"*

- Protect Earth and its biosphere from potential extraterrestrial sources of contamination
  – *avoid "backward contamination"*

International Obligations

- The Outer Space Treaty of 1967
  - Proposed to the UN in 1966; Signed in January 1967
  - Ratified by the US Senate on April 25th, 1967
  - Article IX of the Treaty states that:

    "...parties to the Treaty shall pursue studies of outer space including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose..."

- The Committee on Space Research of the International Council for Science maintains an international consensus policy on planetary protection
  - COSPAR policy represents an international scientific consensus, based on advice from national scientific members, including the US Space Studies Board
  - COSPAR is consultative with the UN (through UN COPUOS and the Office of Outer Space Affairs) on measures to avoid contamination and protect the Earth under the Treaty
  - NPR 8020.12 specifies that international robotic missions with NASA participation *must follow COSPAR policy, providing a consensus basis for requirements*

PPS Advisory Functions

- Provide advice at a finer level of detail than the Space Studies Board
  - Review mission activities and provide advice on implementation options
  - Make recommendations on specific points of policy not specified by international policy or the Space Studies Board
  - Provide guidance regarding programmatic direction and issues of relevance to future implementation of planetary protection requirements
- Serve as a venue for coordination between NASA and other agencies, both US Gov't and international partners
  - Need to strengthen committee membership, both 'normal' members and *ex officio* representatives

NASA Planetary Protection Policy

- The policy and its implementation requirements are embodied in NPD 8020.7G *(approved by NASA Administrator)*
  - The Planetary Protection Officer acts on behalf of the Associate Administrator for Science to maintain and enforce the policy
  - NASA obtains recommendations on planetary protection issues (requirements for specific bodies and mission types) from the National Research Council's Space Studies Board
  - Advice on policy implementation is obtained from an 'internal advisory group:' the NAC Planetary Protection Subcommittee
- Specific requirements for robotic missions are embodied in NPR 8020.12D *(approved by SMD Associate Administrator)*
  - Encompasses all documentation and implementation requirements for forward and backward contamination control on robotic missions
  - Compliant with COSPAR policy: NASA supports international missions only if COSPAR policy is followed

Managing Planetary Protection

- Four major areas of activity
  - Preparation for upcoming missions
  - Monitoring existing missions
  - Policy development
  - Programmatic considerations

Preparing for Upcoming missions

- The Space Studies Board has completed the next Decadal Survey for NASA's Planetary Science Division
  - Objective is to obtain and reflect the consensus of the community regarding priorities and goals for Planetary Science
  - Intended to serve as a roadmap for the next 10 years of NASA activities
- Planetary protection technology development will be essential to accomplish these goals
  - The highest priority flagship missions will be to Mars or Europa, with Enceladus tied for third: the three places of highest concern for planetary protection

Current Missions

- Several in-preparation Mars missions in which NASA participates are facing issues on which advice would be useful
  - Selection of the landing site for the Mars Science Laboratory rover will take place this summer : the rover is prohibited from landing in locations where water-ice may be present within a meter of the surface
  - The Russian-led mission Phobos-Grunt will carry hardware from a US non-profit organization, the Planetary Society, as well as include NASA-funded participation of a data-analysis effort. Understanding the implementation of COSPAR policy is required to ensuring compliance with NASA policy
  - The involvement of US private entities in international space exploration missions raises questions regarding US compliance with the Outer Space Treaty

MSL Landing Site Selection

- Due to the presence of a Radioisotope Power Source (perennial heat source) planetary protection requires that MSL avoid sites with near-subsurface ice
  - Models suggest that off-nominal impact of MSL could create a crater up to 5 meters deep
  - The '1-sigma' landing ellipse includes the possibility of failure by any operation that has a <99% probability of being executed successfully prior to parachute opening, and all failures after that event
  - Recent data obtained at Mars has been interpreted as indicating water ice and hydrated minerals in areas much closer to the planet's equator than current models predict: this requires reanalysis of the four proposed landing sites, to ensure that planetary protection requirements are met

Updates to Policy and Requirements

- Several milestones have been accomplished since the previous meeting
  - The robotic requirements document NPR 8020.12 increase coordination between ESA and NASA planetary protection requirements (tomorrow)
  - Plans for human missions to other planetary bodies necessitates the development of an equivalent document for human missions: will be coordinated with the Chief Health and Medical Officer and other relevant entities
  - Improved coordination between agency-level policies facilitates future joint missions to Mars and Outer Planets

Plan for a possible joint meeting of the NASA and ESA advisory bodies associated with the MSL launch in December 2011

Programmatic Considerations

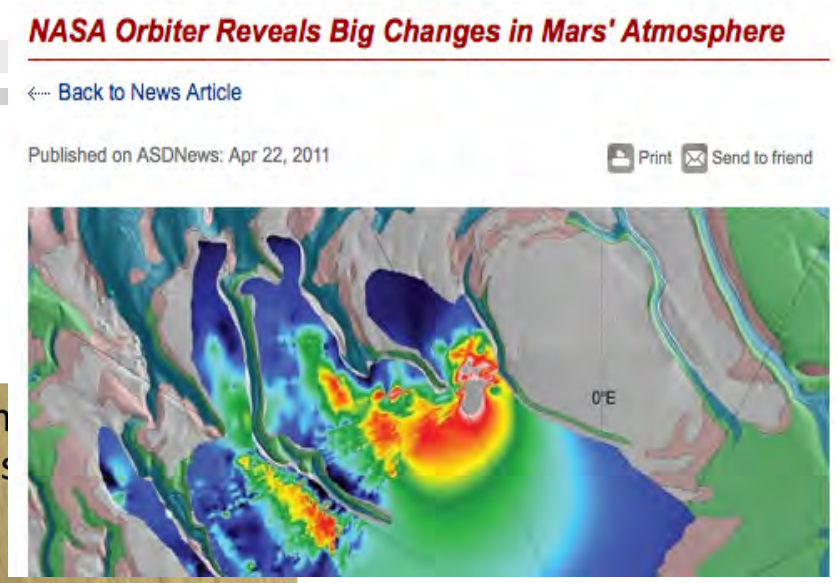
- Future missions will require more resources for planetary protection, but PPO budget and staffing have remained constant

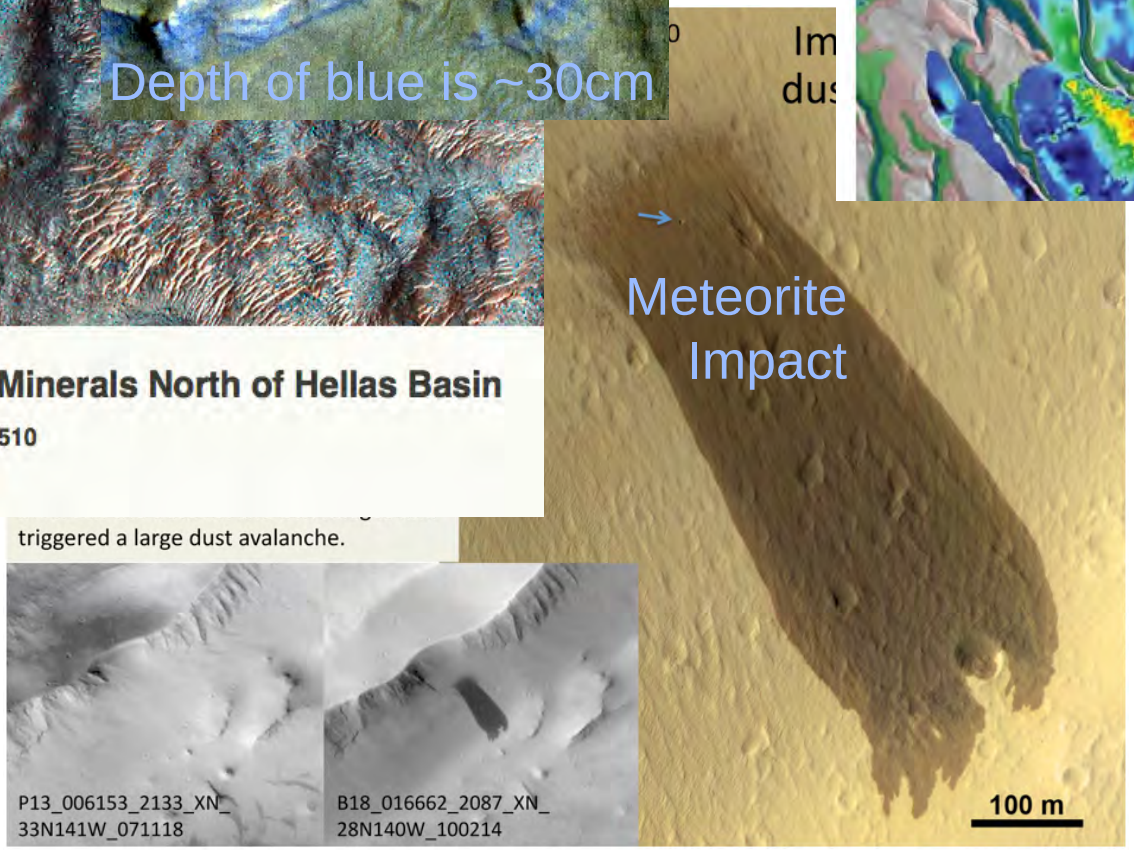
– The PPR program has provisionally selected one proposal submitted to the program in 2010, out of a number of good projects – this proposal could not have been funded without other actions taken to reduce ongoing programmatic costs (mission monitoring, training, etc.), and funding is still in jeopardy

– Progress has been made in establishing core capabilities for planetary protection, such as guaranteed access to a microbiology lab at Kennedy Space Center for training courses and mission activities

– Implementing any of the Decadal Survey-endorsed flagship missions will require planetary protection implementation on a scale not previously performed, yet funding has not been identified to support the necessary technology development

Mars is a wonder-ful place...





triggered a large dust avalanche.

MRO's Context camera (CTX) acquired the image at lower left on18 Nov 2007 and the adjacent image on 14 Feb 2010, showing a large new slope streak

Important Stuff

- Committee Dinner Suggestions?
  - Please suggest possible venues during the coffee break
  - The choice will be made and headcount taken just before lunch
- Please send names of potential committee members to Gene, George, and me, at any time
  - Thanks for previous recommendations!