Reform and Re-Evaluation of Planetary Protection Policy in the Contemporary Era of Interplanetary CubeSat Utilisation and Development

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Planetary Protection: Dramatic Sci-Fi or Sterile Solar System Practises?

Planetary Protection Misconceptions:
- Space Warfare,
- Alien Invasions,
- Asteroid Defense,
- Orbital Space Debris,
- & the dozens of other sci-fi-esque connotations that arise when hearing the term.

What Planetary Protection Actually is:
- The practice of protecting target celestial bodies from contamination by Earth life, and protecting Earth from possible life forms that we might bring back.

(...So perhaps it is a little Sci-Fi)
"...We are in the awkward situation of being able to spoil certain possibilities for scientific investigations for a considerable interval before we can constructively realize them... we urgently need to give some thought to the conservative measures needed to protect future scientific objectives on the moon and the planets..." J. Ledeberg and D. B. Cowie, Science, 1958

Not a modern phenomena. It’s roots lie pre-1957, and it has been a consistent element of space development ever since.

1961 Ranger Missions were the first to apply the concept, & since then, all state led planetary missions have had to implement Planetary Protection measures (at varying degrees).
The Roots of Planetary Protection

Preparing a Viking Lander for dry heat microbial reduction. — Photo credit NASA
The Implementation of Planetary Protection

The legal basis for planetary protection was established in Article IX of the United Nations Outer Space Treaty (1967):

the study and exploration of outer space must be conducted in a manner “...as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter”

COSPAR maintains and promulgates a planetary protection policy for the reference of spacefaring nations.

No federal regulatory agency with the necessary jurisdiction over the actions of Private-Actors, regardless of threats to planetary protection...
### How Planetary Protection Policy is Applied in the Context of iCubeSats

**Category I:**
“not of direct interest for understanding the process of chemical evolution or the origin of life.” (i.e. Io, the Sun)

**Category II:**
“... where there is only a remote chance that contamination carried by a spacecraft could jeopardize future exploration”. (i.e. Callisto, Comets)


**Category III:**
“...where there is a significant chance that contamination carried by a spacecraft could jeopardize future exploration.” (i.e. Mars, Europa, Enceladus)

Documentation (Category II +): Pc Analysis Plan, Microbial Reduction Plan, Microbial Assay Plan, Organics Inventory

Implementing Procedures such as: Trajectory Biasing, Cleanroom, Bioburden Reduction, & Partial Sterilization of Contacting
In response to a request from NASA, the ‘National Academies of Sciences, Engineering, and Medicine’ established a Committee to Review the Planetary Protection Policy Development Processes to examine the history of planetary protection policy, assess the current policy development process, and recommend actions to improve the policy development process in the future.

- The report highlights the exponential development/ changes in Space Science since the establishment of PP.
- Calls for new NASA planetary protection strategies, and acknowledgement of the importance of the private sector.
Empower a single agency to regulate private-sector space activities that raise planetary protection concerns.

provide a federal regulatory agency with authority over private-sector space missions, the exercise of which is informed by an interagency process.

Develop a planetary protection strategic plan that clearly addresses the agency's approach for
• Managing planetary protection policy implementation,
• Securing relevant outside expert advice,
• Developing a long-range forecast of future solar system exploration missions having planetary protection implications,
• Setting planetary protection research and technology investment priorities, and
• Identifying the agency's strategy for dealing with major policy issues such as sample return, human missions to Mars, and private-sector involvement in solar system exploration missions.
In Summary...

- Planetary Protection Policy is flawed, and in immediate need of reform.

- This was highlighted in the ‘Review and Assessment of Planetary Protection Policy Development Processes’ Report, and we can expect reform in the near future.

- These changes are going to have substantial direct impacts upon the future development and utilization of Interplanetary CubeSats.

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