

New Challenges in Planetary Protection for International Astrobiology-Driven Explorations

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Planetary protection is an international and interdisciplinary activity among scientific, technological, operational and administrative countermeasures to preserve biospheres of both the Earth and exploration targets, should they have a scientific potential to have one, including Mars and some icy satellites of Jupiter and Saturn such as Europa, Ganymede, Enceladus and Tian. It also deals with all sample return missions to assess risks of each returned sample if they may endanger the terrestrial biosphere, according to a scientifically internationally agreed evaluation process endorsed by COSPAR Planetary Protection Panel, the worldwide authority to which all major spaced agencies follow their compliance.

In the coming decades, deep space exploration will focus on astrobiology-driven missions more than ever. Thus international space exploration community must work closely with the planetary protection issues of following respective missions to make them an enabler, rather than a show stopper.

Mars exploration now faces how to prevent terrestrial contamination at potentially inhabited regions like recurring slope lineae in order to search for direct evidence of indigenous life there. Also human landing and habitation, no matter sortie for the NASA plan or even permanently for Mars One, pauses serious contradiction with robotic life detection missions.

D/P-type asteroids such as the Martian satellites and Jupiter Trojans are now considered to be realistic targets for next generation robotic sample return missions while they still lack definite analog meteoritic samples on the earth, unlike S-type and C-type asteroids. Their present status of the restricted Earth return must be re-evaluated with the most updated scientific knowledge today, before COSPAR will endorse any of these sample return missions.

Sample returns of plume particles from icy bodies are a game changer of deep habitat research. Yet there have been few studies of planetary protection and contamination/alteration control at the sampling, return cruising, earth re-entry and subsequent laboratory analyses.

This presentation explains the above challenges and summarizes current efforts and future prospects how to overcome them.

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