PLANETARY PROTECTION TECHNOLOGY DEFINITION TEAM: TASKS, STATUS, AND FEEDBACK. M. A. Meyer[1] and J. D. Rummel[2], [1]Planetary Science Division, SMD, NASA HQ, Washington, DC 20546, michael.a.meyer@nasa.gov, [2]SETI Institute, 189 Bernardo Ave, Suite 200, Mountain View, CA 94043, jrummel@seti.org.

Introduction: In accordance with international treaty obligations, NASA maintains a planetary protection policy to avoid the contamination of extraterrestrial bodies during spaceflight missions. Requirements are levied on NASA's Planetary Science program to prevent the contamination of solar system targets of exploration with terrestrial organisms and organic compounds (forward contamination), and to prevent the uncontrolled introduction of extraterrestrial life to the Earth (backward contamination).

In the forward direction, targets of high astrobiological significance due to the potential for native life are of highest concern for planetary protection, because these locations are also more likely to provide habitats for Earth life. Constraints on such missions include the requirement to reduce the biological contamination carried by the spacecraft and ensure prevention of recontamination, constraints on spacecraft operating procedures, and inventories of organic constituents of the spacecraft and organic samples—in addition to the standard requirements to document spacecraft operations, impact potential, and the location of landings or impact points on planetary surfaces or other bodies.

In the backward direction, similar concerns are evinced in the areas of engineering and technologies to ensure encapsulation and containment of the samples while breaking the chain of contact between the sampled planetary environment and the uncontained portion of the spacecraft returning the sample. For future robotic missions to astrobiologically significant destinations, such as ocean worlds, a prime focus has to be on avoiding the release of Earth contamination that may confound future observations and experiments.

Tasks: The Planetary Protection and Technology Definition Team (PPTDT) has been established to provide for optimal planning and the future implementation of missions to astrobiologically significant targets. This Team has been tasked with the following:

- Assess technical and engineering challenges to applying available microbial-reduction methods, including recontamination prevention, to spacecraft hardware and instruments, to meet current NASA requirements on preventing the forward contamination of potentially habitable worlds by future spacecraft missions;
- Provide a list of spacecraft and instrument materials known to be compatible with existing planetary protection protocols;
- Delineate planetary protection protocols/processes available or which appear promising;
- Identify areas ripe for technological development;
- Evaluate technical and engineering challenges to ensuring that spacecraft hardware and instruments can meet organic cleanliness requirements needed to differentiate Earth contamination from extraterrestrial signals;
- Propose approaches for mitigating the identified challenges that would allow instruments to be flown successfully at the required levels of cleanliness and microbial reduction, beginning with identification of commonly used materials and spacecraft hardware that are compatible (or particularly vulnerable) to planetary protection protocols;
- Identify engineering, technology, and scientific research and development that could be funded by NASA to provide future capabilities to field scientific instruments and spacecraft on missions that require microbial reduction and recontamination prevention.

Status and Feedback: The status of the PPTDT's study will be reported along with their initial findings. In addition, feedback is requested from the instrumentation community to ensure that the Team has considered a broad range of instrument challenges, possible planetary protection techniques, and potential approaches.

References: 1) Frick, A., R. Mogul, P. Stabekis, C.A. Conley, and P. Ehrenfreund. Overview of current capabilities and research and technology developments for planetary protection. Advances in Space Research 54: 221–240 (2014). 2) Space Studies Board, National Research Council, Preventing the Forward Contamination of Mars, National Academy Press, Washington, DC (2006).