

# Planetary Protection and Lunar Activities

RESEARCH SALON #4 | JULY 9 2020



Moon Dialogs

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The Moon Dialogs Research Salons seek to cultivate thought leadership on lunar surface coordination mechanisms to accelerate a peaceful and sustained presence on the Moon. The initiative will focus on advancing concrete approaches to operating standards, norms, and economic foundations, with an emphasis on applied and 'bottom-up' approaches, and creating opportunities for voluntary coordination between and amongst industry, government, and academia alike.

## Planetary Protection and Lunar Activities Panel

The fourth Moon Dialogs Research Salon took place on Thursday, July 9, with opening remarks by NASA Administrator Jim Bridenstine followed by a regulatory and policy roundtable featuring Mike Gold, NASA Acting Associate Administrator for the Office of International and Interagency Relations; Tanja Masson-Zwaan, Deputy Director of the International Institute of Air and Space Law at Leiden University; Lindy Elkins-Tanton, Planetary Scientist and Principal Investigator on the Psyche Mission; and Alan Stern, Planetary Scientist and Chair of NASA's Planetary Protection Independent Review Board.



**Jim Bridenstine** began his remarks by announcing two new NASA interim directives (NIDs), reflecting NASA's evolving position on forward and backward biological contamination on the Moon. NASA's views began to shift in 2009, following the discovery of hundreds of millions of tons of water ice on the Moon, and the possibility of contaminating the Moon with biologicals from Earth. At that point, the Moon was categorized as Category II under the COSPAR Planetary Protection Guidelines, which focuses on preventing forward contamination. Bridenstine stressed that new exploration programs will need to strike a balance between sending astronauts to other planetary bodies, and maintaining the pristine environments of those bodies critical for scientific research. A balance is also needed between the interests of the science community, the human exploration community, and the commercial community, as recommended by NASA's Planetary Protection Independent Review Board. On the implications of different regional interests, both for sensitive science and expansive human landing activity, Jim highlighted NASA's flexibility to revisit and modify the interim directives based on future recommendations by the Review Board, and their desire to work with international partners to bring certainty to the development of the lunar environment and its stakeholder communities.

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## PLANETARY PROTECTION AND LUNAR ACTIVITIES PANEL

Following the presentation by NASA's Administrator, Professor Michelle Hanlon moderated a panel with Mike Gold, Tanja Masson-Zwaan, Lindy Elkins-Tanton, and Alan Stern.



**Mike Gold** spoke about the Artemis Accords, which address harmful interference, in contrast to the method applied in COSPAR. In the Artemis Accords, the avoidance of harmful interference means that countries that join would have to respect this principle (forming an essential part of bilateral agreements); whereas with COSPAR, an administrative process is followed in determining the parameters of harmful interference. Under COSPAR, these NIDs would first be shared with National Academies, industry and other stakeholders, who would then provide feedback to develop planetary policy. Responding to whether planetary protection would also encompass radio frequency interference, Mike made reference to the fact that while there are no hard rules in resolving this, the broad principle of harmful interference would find practical relevance in this scenario. While a specific procedure has not been determined for this scenario, the existing frameworks outline principles which provide guidelines.



**Tanja Masson-Zwaan** commented that she was not sure whether a global institution for planetary protection would be necessary as there already exists behavioural norms associated with the Outer Space Treaty. With more than 130 parties and/or signatory states connected to this document - which contains provisions on planetary protection - it forms the connecting bridge to COSPAR. She stated that planetary protection is an evolving process requiring constant review, as the principles are hardly set in stone in the context of rapid developments in space. In recent decades, she felt that states have been sufficiently self-regulating in applying these currently voluntary guidelines to their missions. Hence, there didn't seem to be an immediate need for an oversight system. However, with privatisation, states may establish domestic requirements for planetary protection as a prerequisite to securing licensing. Ms. Masson-Zwaan added that international and diverse stakeholder consultation was required to ensure consensus in designating the different categories of different locations. She expressed hope that the US would continue to seek the relevant international consultations.

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## PLANETARY PROTECTION AND LUNAR ACTIVITIES PANEL



**Lindy Elkins-Tanton** emphasized the need to regularly revise the guidelines, taking into account different aspects of the exploration of celestial bodies. Planetary exploration will have an emotional impact on perception of the Moon from Earth that must be addressed, together with scientific and aesthetic considerations. Dr. Elkins-Tanton explained that we still do not understand how life arises, and the possibility of finding organic material on other celestial bodies could be a considerable advancement in our understanding. Future investigations at the lunar poles could help us find evidence of early pre-life and clues on the evolution of life on Earth. For this reason, there is a need to consider how future discoveries might be impacted by relaxing protections, and to be adaptive in the elaboration of laws and policies to protect environments that could be irreplaceable. Finally, Elkins-Tanton added that space exploration should be a source of inspiration, to understand and solve problems we may face here on Earth. One day, we should look at the Moon and see people standing there and looking back at us.



**Alan Stern** addressed the NASA Advisory Council recommendation from 2018 on the obsolescence of the COSPAR regulations. Stern underlined how the planetary protection regime had not changed since NASA's Viking program for the exploration of Mars in the mid 1970s. In the past 40 years, Stern noted that there have been many advancements in the technology for biological study, extraterrestrial life detection, and prevention of celestial contamination. Today, we are seeing emerging space powers and commercial participants also developing planetary missions across the solar system. According to Dr. Stern, regulatory certainty and a framework for commercial engagement will allow the use of space to flourish and also be beneficial for the scientific community. Changing the categorization of the lunar surface to category I by default, with only specific areas designated as Category II, is a valuable example of the required flexibility. Stern affirmed the recommendation of the planetary protection independent review board (of which he was the chair), to enable research on the poles of the Moon (where the permanently shadowed regions are), and where there could be astrobiological potential.

The video of Administrator Bridenstine's presentation, and of the entire Moon Dialogs Research Salon on Planetary Protection is available at: <https://vimeo.com/439025625>

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## Discussion Amongst Participants

### On Stakeholders and International Alignment

After the presentation and the panel, attendees and participants at the Research Salon posed some questions for further consideration and discussion. Regarding international implementation, an attendee asked how these interim directives relate to the actions of other spacefaring nations, and whether the existing international legal framework is sufficient for the protection of the Moon and other celestial bodies. Furthermore, how will the general public be involved in these decisions? Related to this, how do we sufficiently consider stakeholder views from diverse and non-space faring groups, without undermining or delaying commercial interests? One participant noted the “longstanding principle” that outer space is a “global commons” was rejected earlier this year by the US President’s Executive Order, and asked how overturning this “long recognised international principle” will affect planetary and lunar protection.

### Moon Dialogs Conveners Comment

*The interim directives announced at this Salon are national measures taken by the U.S. and will only relate to other States as such States may impose similar restrictions on their nationals, either independently or in concert with a bilateral agreement, as part of a collaborative opportunity with the United States. While the current international legal framework governing outer space has served humanity well thus far, the reality is that exploration and other activities are going to fall within gaps inherent in that framework. These Salons are intended to highlight insufficiencies so that solutions may be considered that will assure sustainable and equitable exploration and use. One way for the public to become involved is to start voicing opinions about space exploration to their local government officials. This includes non-spacefaring States, who, given the nature of space as a domain of all of humankind, have the right to be heard with respect to planetary protection and other issues. Another is to encourage an adaptive, evolutionary approach to regulation, such that evolving insights and lessons can be incorporated as operational experience accumulates – indeed, it appears that this is how NASA is treating the Interim Directives. While legal experts disagree as to whether there exists a longstanding principle that outer space is a global commons, it is inarguable that Article IX of the Outer Space Treaty requires States to avoid harmful contamination of the Moon and other celestial bodies. It is this provision that guides State responsibility in respect of planetary protection.*

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## DISCUSSION AMONGST PARTICIPANTS

### On Implementation

Participants discussed the record keeping recommendations associated with the Guidelines and how to ensure they strike the right balance of information without being administratively onerous. According to the 2008 policy, there was no restriction required for any part of the Moon, but that lunar actors just keep track of organics. Another question that came up concerned liability: how can States be held liable for damages caused on celestial bodies? Another participant asked whether these updated guidelines will impact upcoming commercial missions contracted by NASA through its Commercial Lunar Payload Services program, and how (or whether) commercial payloads will be tested or certified. A scenario was posed regarding radio telescopes on the far side of the Moon. Does the policy for the protection of the Moon also include protection of the radio frequency regime? Human exploration with large facilities may impact the low-frequency environment on the Moon which is currently one of the most “quiet” places in the Solar System. One participant reflected on the role of ethics in the planetary protection policies. Considerations might include: (a) Interactions with possible life forms on celestial bodies and the biological impact of human exploration on those environments; (b) Financial burdens on commercial entities, and whether these would take the precedence over moral obligations; (c) Whether different cultural perspectives regarding the Moon should impact exploration behavior (e.g. some groups consider the Moon as sacred in its current form). Participants wondered whether the historic preservation of landing sites and artifacts could play a role in fostering a space economy through visits by both tourists and scientific researchers to these historic sites. Scientific researchers might be interested in long-duration materials science studies at historic exploration sites, where human-made hardware has been exposed to space for long periods of time. How will planetary protection be dealt with at these historic sites? It was also discussed how planetary protection is a strategic issue that may involve many geopolitical uncertainties.

### Moon Dialogs Conveners Comment

*Authorization, supervision, responsibility and obligations are among the most difficult but vital considerations with respect to all space activities. These lines of questions – from radio frequency interference to financial and moral obligations – cut to the heart of the question of protection. Namely, we need to understand what we want to protect and why, before we start regulating protective measures. The Moon Dialogs will be hosting several salons intended to explore the concept of what needs to be protected or at least memorialized as we move forward to build a human community in space.*

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## DISCUSSION AMONGST PARTICIPANTS

### Harmful Interference

The possibility of creating harmful interference was one of the most consistent topics addressed under several points: interference in a biological sense with possible life forms existing on other celestial bodies like the Moon, interference with different kinds of activities both scientific and commercial, and interference with cultural considerations. The list is not exhaustive, as the future of space exploration will present the possibility of harm in many forms, most of which have not yet been encountered. Thus, it is essential to have a set of principles, like those of the Outer Space Treaty, as a base for future implementation. The Artemis Accords' goal is to go that step further and see how to implement these principles.

One of the first aspects to address will be the necessity of coordination between the different actors in finding a way to protect some activities (e.g., radio-astronomy observations) while allowing others to occur. The progress of science is, in fact, indispensable for the development of space activities, and scientific research will increase together with commercial ventures. It will, therefore, be equally important to prevent potential conflicts arising from protection guidelines.

The classification of areas of the Moon will also serve international cooperation and coordination. We currently have a useful mapping of the lunar surface, and a good understanding of its geology. However, there is a great need to create a precise categorization of the different areas, as there is an urgency to provide certainties to commercial actors. Otherwise, planetary protection could constitute a burden to the number of actors flying to the Moon and the money invested in this area, having the effect of discouraging and having a freezing impact on future exploration activities.

We need to think through the cultural and biological significance of lunar exploration, making sure that ethics and natural law are also recognized as a valuable source of law in the creation of regulation.

The historic preservation of landing sites and artifacts could play a role in fostering a space economy that involves visits by both tourists and scientific researchers who might be looking at long-duration material science studies on the artifacts or other aspects of scientific interest. Therefore there is a considerable need to balance exploration, science, cultural history, and cultural heritage, creating a regime where we can manage the protection of the Moon.

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## DISCUSSION AMONGST PARTICIPANTS

The cancellation of the UN COPUOS sessions this year, due to the global pandemic, created a vacuum in the discussion at the global intergovernmental level on those points relating to the utilization of space resources, governance of planetary missions, and the future of space exploration. However, the research and space exploration activities did not stop, and it is necessary to look urgently at the ways of coordinating the interests involved. Still, the discussion can not take too long. Commercial interests must be taken into account, and the time value of money must not be forgotten. There are now short timeframes for investment, and the current situation of uncertainty could move commercial development to other areas.

## Reflections and Calls to Action

### Reflections

The new Interim Directives on planetary protection received an overall positive reception, but – as they are new – there are still several open questions, including (a) Application or extension to private activity: will the United States (and other countries) pursue planetary protection requirements and regulations for commercial and private actors, whether at the launch, operational, or payload level? (b) International coordination: it's clear that NASA intends to bring its approach to COSPAR, but in the event that consensus is not reached at the international level, how will conflicting approaches to different areas of the Moon be reconciled? Similarly, how or will the guidelines be applied to non-area-based phenomena such as dust, exospheric contamination, and radio frequencies? (c) Though there appeared to be broad support for adaptive and evolutionary protection rules, how will their continued development be implemented in practice, and who will be involved in these decisions?

### Calls to Action

In taking the next steps on these NASA Interim Directives, the space community ought to develop more detailed recommendations regarding implementation of the above open questions. The commercial community could develop its own proposals regarding adherence to planetary protection requirements in a way that would balance operational, commercial and science considerations. Civil society could consider a standing committee or other mechanism or platform (perhaps utilizing the Moon Dialogs) to respond to new developments affecting planetary protection in an agile and competent fashion. A more detailed examination of specific areas or phenomena on the Moon not yet addressed by the guidelines could be made in order to inform bespoke protection recommendations.





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