

Space Law – Future Challenges and Potential Solutions

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Article IX of the Outer Space Treaty gains significance in light of a growing number of outer space missions, thereby increasing the possibility of forward and backward contamination that the provision seeks to prevent. Yet, the scope and ambit of Article IX remains ambiguous at best, thereby posing a major challenge to space law especially in the near future which marks the return of sending biological organisms and even humans to space. As an illustration, the Phobos Grunt Mission launched by Roskosmos is carrying, *inter alia*, hardware to transport samples of a variety of dormant *biological organisms* beyond the Earth's orbit. This paper attempts to provide an interpretation of Article IX of the Outer Space Treaty as a potential solution to this challenge. Article IX mandates States to undertake “appropriate measures” to prevent contamination of the environment of the Earth and outer space. However, definition of these “appropriate measures” remains unclear as the text and the drafting history of the treaty provide no indication. Thus, the paper deals with two pertinent aspects of the interpretation of Article IX: *first*, the nature of “appropriate measures” to be taken by a space agency to fulfil the requirements of Article IX and *secondly*, which state in an operation involving multiple space agencies has *that* obligation. *First*, it is submitted that the “appropriate measures” are the guidelines laid down in the planetary protection policy adopted by the Committee on Space Research [“COSPAR”]. Hence, the policy is binding on space agencies. The basis for this obligation arises from the interpretation of Article IX using the test of “subsequent practice” as laid down in Article 31(3)(b) of the Vienna Convention on the Law of Treaties. All space missions, as elucidated in the paper, launched in outer space till date have claimed to follow the policy. Other instances of state practice have also been analysed. *Secondly*, the paper addresses the question of *which State* is obligated, under Article IX, to take these “appropriate measures”. Today, most missions involve more than just one State and even private corporations. This poses a challenge to space law as the treaty regime is mainly state-oriented. In such a scenario, it is submitted that the space agency having the “effective link” with the mission is obligated to ensure that the policy is followed for all component parts of the mission.

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1 Introduction

In the coming decade, space law is going to face one of its most serious challenges – planetary protection. Other than the United States,¹ and its Mars Science Laboratory, a number of agencies are planning to send missions to Mars by the late 2020s. These include the European Space Agency with its ExoMars mission in 2016,² Russia with the Mars-Grunt missions,³ China⁴ and India with the Mars Orbiter Mission scheduled to be launched in 2013.⁵ With missions to planetary bodies no longer being the monopoly of one state, it is an appropriate time to look at whether *corpus juris spatialis* as it stands today is prepared to address this development and its associated risks. As an illustration, the Roskosmos mission, “Phobos-Grunt”, which unfortunately failed to reach the Martian orbit, carried the Living Interplanetary Flight Experiment (LIFE) prepared by the Planetary Society. The purpose of LIFE was to discover the effects on microorganisms from spatial exposure. At the same time, apart from landing on Phobos to collect samples, since it was a return mission, Roskosmos undertook extensive precautionary measures to prevent any possible contamination. Indeed, that is the mandate of Article IX of the Outer Space treaty – to prevent any forward or backward contamination of Outer Space. In fact, the Moon Agreement, particularly Article 7(1), was drafted keeping in mind the possibility of inter-planetary spaceflight and planetary protection. However, the Moon Agreement has only seen a few ratifications and even the relevant articles under the space treaties are *prima facie* ambiguous. This paper attempts to address the seemingly drastic lacuna in international space law. The recent incident involving the NASA rover “Curiosity” highlights the significance of the issue. As Professor von der Dunk pertinently noted, albeit in a different context, “*Cynics would say: space lawyers must have been waiting for this for decades, and now will of course immediately call for additional regulation.*”⁶ But indeed, the incident, in which, the project developers of the Mars Science Laboratory, made an internal decision not to send the equipment

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1. Mars Science Laboratory Curiosity Rover, available at <<http://mars.jpl.nasa.gov/msl/mision/overview>> (last visited September 11, 2012).
 2. The ExoMars programme 2016-2018, available at <http://exploration.esa.int/science-e/www/object/index.cfm?fobjectid=46048> (last visited September 11, 2012).
 3. *Phobos-Grunt: Failed probe “falls over Pacific*, BBC News (January 15 2012) <www.bbc.co.uk/news/science-environment-16491457> (last visited September 11, 2012).
 4. *Brics in Space*, New York Times (August 30 2012), available at <<http://latitude.blogs.nytimes.com/2012/08/30/iindi-and-china-race-to-send-a-mission-to-mars>> (last visited September 11, 2012).
 5. *Mars Mission: Demonstrating India’s Technology*, BBC News (August 3 2012), available at <www.bbc.co.uk/news/world-asia-india-19110039> (last visited September 11, 2012).
 6. Von der Dunk, *Too-Close Encounters of the Third-Party Kind: Will the Liability Convention Stand the Test of the Cosmos 2251 Iridium-33 Collision?* PROCEEDINGS OF THE 50TH COLLOQUIUM OF THE LAW OF OUTER SPACE 199, 199 (2009).

through a final ultra-cleanliness step, required to make sure Earth life is not transported to the Martian surface, marked a major deviation from the planetary protection principles.⁷ The reason stated for not going through with the final step was that the mission was designed to comply with a requirement to avoid going to any site on Mars known to have water or ice within 3.3 feet of the surface, to ensure no organic contamination of the Martian surface can take place, so that no future mission to the planet is jeopardized, thus not going through with the step would not have any effect on the mission or on the Martian surface. The decision not to go through with the final planetary protection step however has put any future mission at just such a risk. The biggest issue however, was that the decision was not forwarded to NASA in charge of planetary protection, Catharine Conely, until very late, by which time, nothing could be done.

2 Article IX of the Outer Space Treaty and Tools of Treaty Interpretation

While Article IX of the Outer Space Treaty and Article 7(1) of the Moon Agreement both address the issue of planetary protection, the present paper focuses on Article IX as the Outer Space Treaty has been ratified by all space-faring nations and as a consequence, creates binding obligations on such nations. However, due reference is made to other relevant rules of international law. Article IX, in its relevant part, states that:

States 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 extra - terrestrial matter and, *where necessary, shall adopt appropriate measures for this purpose.* [emphasis supplied]

In effect, Article IX of the Outer Space Treaty mandates states to undertake appropriate measures to prevent the contamination of Earth, outer space and other celestial bodies. Generally, words in a treaty are to be given their ordinary meaning in light of the object and purpose in which they are states.⁸ Contamination means *any introduction by man, directly or indirectly, of substances that result or which may result in deleterious effects to the lunar or other celestial bodies? natural environment and any other action that may cause adverse changes to that environment.*⁹ In the context of Article IX, contamination may

7. <www.space.com/13783-nasa-msl-curiosity-mars-rover-planetary-protection.html>.

8. Article 31(1), VIENNA CONVENTION ON THE LAW OF TREATIES, 1155 UNTS 331 (1969).

9. Fabio Tronchetti, THE EXPLOITATION OF NATURAL RESOURCES OF THE MOON AND OTHER CELESTIALBODIES- A LEGAL REGIME 269 (2009).

refer to “forward contamination” caused to outer space and celestial bodies or “back contamination” caused to Earth.¹⁰ That contamination is given a broad definition and should be prevented is settled.¹¹ The unsettled question arises as to the State's obligation – its nature and extent, under Article IX. The nature of “appropriate measures” under Article IX remains uncertain and ambiguous.

Articles 31 and 32 of the Vienna Convention on the Law of Treaties codify the customary international law on the interpretation of treaties.¹² In the course of the paper, recourse shall be taken to three tools of interpretation mentioned therein – *first*, travaux préparatoires¹³ or the drafting history of Article IX which elucidates the intent of the States while including this article and specific words; *secondly*, the subsequent practice of States¹⁴ in relation to Article IX, particularly the planetary protection measures taken by different states in actual missions and national policies and; *thirdly*, other relevant rules of international law¹⁵ including international environmental law which play a crucial role in prevention of environmental contamination.

3 History of Article IX

The origins of Article IX can be traced back to the COSPAR Committee on Contamination by Extra-Terrestrial Exploration, set up in 1958.¹⁶

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10. Stephen Gorove, *Legal Aspects of Pollution and Outer Space* “PROCEEDINGS OF THE 14TH COLLOQUIUM ON THE LAW OF OUTER SPACE” 63, 67(1971); N M Poulantzas, *Legal Problems arising out of Environmental Protection of Earth*, PROCEEDINGS OF THE 14TH COLLOQUIUM ON THE LAW OF OUTER SPACE 73, 75(1971); Stephen Gorove, *Pollution and Outer Space: A legal analysis and Appraisal*, 5 NEW YORK UNIVERSITY JOURNAL OF INTERNATIONAL LAW AND POLITICS 53, 57 (1972).
 11. P.M Sterns, *Principles of Protection of Outer Space Environment in the Corpus Juris Spatialis*, PROCEEDINGS OF THE 30TH COLLOQUIUM ON THE LAW OF OUTER SPACE 172, 172 (1987).
 12. For a general discussion, see Villiger, COMMENTARY ON THE VIENNA CONVENTION ON THE LAW OF TREATIES, 415 – 449. The provisions were held to be codificatory of customary international law by the International Court of Justice in Case Concerning the Gabcikovo-Nagymaros (Hungary v. Slovakia), 1997 I.C.J. 67 and the Case Concerning the Maritime Delimitation and Territorial Questions between Qatar and Bahrain (Qatar v. Bahrain) 1994 I.C.J. 121.
 13. Article 32, VIENNA CONVENTION ON THE LAW OF TREATIES, 1155 UNTS 331 (1969).
 14. Article 31(3)(b), VIENNA CONVENTION ON THE LAW OF TREATIES, 1155 UNTS 331 (1969).
 15. Article 31(3)(c), VIENNA CONVENTION ON THE LAW OF TREATIES, 1155 UNTS 331 (1969).
 16. Hobe et al, COLOGNE COMMENTARY ON SPACE LAW, 171.

Subsequently, in its 1959 report, the newly established United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), dedicated Part III to the issues of contamination.¹⁷ In the following years, a number of countries put forward draft resolutions, seeking to protect the Outer Space environment and Earth's environment.¹⁸ This was further given an impetus by the USSR's vehement denouncement of the infamous "West Ford Experiment" conducted by the United States, in 1963.¹⁹ Due to this, and an increasing pressure to have some sort of an international agreement on outer space activities, in 1963, the General Assembly adopted the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space.²⁰ Principle 6 of this resolution is the immediate precursor to Article IX. This Declaration was however non-binding, and the Legal Subcommittee was given the task of preparing a *binding* legal document based on these adopted principles.²¹ In the discussions that followed, the Legal Subcommittee was given two drafts, prepared by the USA and the USSR respectively, both of which contained a provision nearly identical to Principle 6 of UNGA Resolution 1962 (XVIII), with some additions by either party.²² The draft finally submitted to the General Assembly on 15 December 1966, contained in its Article IX, a compromise provision, which reflected both the USSR and the USA's position, though the influence of the USSR draft was far more visible. On 19 December 1967, this draft, with all its final wording, was adopted unanimously by the General Assembly as UNGA Resolution 2222 (XXI).

4 The COSPAR Planetary Protection Policy and the Subsequent Practice of States

The COSPAR Planetary Protection Policy is an international policy standard, that is to be used by all spacefaring nations as a reference on planetary protection policies to be adopted for procedures to avoid biological and organic contamination in space exploration and to provide guidelines to guide compliance with the wording of the Outer Space Treaty and other relevant international agreements.²³

17. *Ibid.*

18. Hobe, above n 16 at 171.

19. H.A. Baker, *Protection of the Outer Space Environment: History and Analysis of Article IX of the Outer Space Treaty*, (1987) XII Annals of Air and Space Law 143; Williams, *Development of Article IX of the 1967 Space Treaty*, PROCEEDINGS OF THE 40TH COLLOQUIUM ON THE LAW OF OUTER SPACE (2000).

20. UNGA Resolution 1962 (XVIII).

21. MeishanGoh et al, *Mars through a Looking Glass: An Interdisciplinary Analysis of Forward and Backward Contamination*, Space Policy 20(2004) 217-225.

22. Hobe, above n 16 at 173.

23. Conley et al, *Planetary Protection and Article IX of the Outer Space Treaty*.

The policy lists five categories of missions, which include missions to target bodies which are not of direct interest to understanding chemical evolution or the origin of life; missions to bodies which are of such interest but where there is only a remote chance that contamination by the space craft would jeopardize future missions; certain types of missions to bodies which are of origin of life interest but where there is a significant chance of contamination which can jeopardize future biological experiments; other types of missions to such bodies of interest where there is a chance of contamination; and all Earth-return missions.²⁴ In the preamble of this policy, COSPAR has noted that Article IX of the Outer Space Treaty calls for the adoption of appropriate measures by spacefaring nations to prevent contamination of the Earth and of Outer Space.²⁵ It is submitted that the guidelines provided for in this policy are “appropriate measures? as envisioned in Article IX.

The guidelines in the policy have been adopted by the agencies of a number of spacefaring nations, including the major agencies of NASA, ESA, JAXA²⁶ and the Canadian Space Agency²⁷. NASA, through its Policy Directive 8020.7²⁸ and Procedural Requirements Document NPR 8020.12²⁹ and ESA through its Planetary Protection Policy ESA/C(2007)112,³⁰ have taken on the burden of following the COSPAR policy on all of their missions. Further, the policies of both these agencies specify that their support will be provided to international mission only if all the mission participants agree to follow the COSPAR Planetary Protection Policy.³¹

In the event that there are two or more space agencies or a private agency involved in a space activity, the obligations fall upon the “the lead space agency.”³² In the Phobos-Grunt project 2011, wherein a private corporation in the United States had developed dormant biological organisms to be carried to the Mars in a Russian space craft, the Russian Space Agency was required to comply with the COSPAR guidelines.³³

24. COSPAR Planetary Protection Policy (20 October 2002; Amended 24 March 2005).

25. *Ibid.*

26. The Hayabusa Mission, *available at* <www.oosa.unvienna.org/pdf/pres/sts_c2010/tech-44.pdf> (last visited on September 11 2012).

27. CSA, Canadian Scientific Priorities for the Global Exploration Strategy, p. 11-13 *available at* http://www.asc-csa.gc.ca/pdf/csew6_rapport-2009-05-30_en.pdf (last visited on Feb. 22, 2011).

28. NASA Policy Directive 8020.7E (June 1, 2002), *available at* <www.spaceref.com/news/viewsr.html?pid=5602> (last visited September 10, 2012).

29. NASA Procedural Requirements NPR 8020.12, *available at* <http://nodis3.gsfc.nasa.gov/npg_img/N_PR>.

30. ESA, Study on Establishing a ESA Planetary Protection Policy, Strategy 03/L30 *available at* <www.esa.int/SPECIALS/GSP/SEMBJSYO4HD_0.html> (last visited on September 10, 2012).

31. Conley, above n 23.

32. COSPAR PP Policy.

33. Conley et al, *Planetary Protection and Article IX of the Outer Space Treaty*.

5 Other Relevant Rules of International Law

The ICJ in *Legality of the Threat or Use of Nuclear Weapons*³⁴ held that the duty to prevent contamination of the environment of Earth from activities under its jurisdiction and control formed a part of customary international law.³⁵ Article 3 of the ILC Draft Articles on the Prevention of Transboundary Harm from Hazardous Activities impose an obligation on the state to take “*all appropriate measures to prevent significant transboundary harm or at any event to minimize the risk thereof.*” This article has merely codified customary law³⁶ as the state which conducts a hazardous activity must assume certain obligations and undertake preventive measures.³⁷ It is further recognized in international law that all space activities are ultra-hazardous in nature.³⁸

6 Conclusion

It can thus be seen, from the various proposed missions to Mars by a multitude of nations and the recent planetary protection controversy surrounding the NASA Mars rover, Curiosity, it is necessary now, more than ever to suggest a binding international norm with regard to planetary protection measures, to prevent both backward and forward contamination. This norm is envisioned in the phrase “appropriate measures” in Article IX of the Outer Space Treaty. It can also be noted, from the history and the phrasing of the Outer Space Treaty, that this treaty and its provisions are binding. It is therefore submitted that “appropriate measures” in the case of planetary protection procedures is the COSPAR Planetary Protection Policy. This planetary protection policy were intended to be a guideline for nations to form their own protection policies, but the adoption of the COSPAR policy by major spacefaring nations such as the USA, the European Union and Japan, has made the adoption of this policy a part of binding international law.

34. *Legality of the Threat or Use of Nuclear Weapons (Advisory Opinion)* (1996) ICJ Lexis 8.

35. *Ibid*; *Nuclear Tests (Australia v. France)*, Judgment, (1974) ICJ Reports 253; *Trail Smelter Arbitration (US v Canada)* (1938 and 1941) 3 RIAA 1905, 1963; Philippe Sands, *Principles of International Environmental Law* (2003) 875.

36. International Liability for Injurious Consequences arising out of Acts not Prohibited by International Law (prevention of transboundary damage from hazardous activities), 52nd session of the International Law Commission, U.N. Doc. A/CN.4/509, 7.

37. Julio Barboza, “International Liability for the Injurious Consequences of Acts Not Prohibited by International Law and Protection of the Environment (1994) 247 *Recueil des Cours* 291, 349.

38. Hobe, above n 16, 176.