Human settlement of Mars in the context of the *Outer Space Treaty* 1967

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I hereby declare that I have read and understood the regulations governing the submission of Master of Laws (International Law) dissertations, including those relating to length and plagiarism, as contained in the rules of this University, and that this dissertation conforms to those regulations.

Signed by candidate

18 February 2018

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I INTRODUCTION

'Earth is the cradle of mankind; but one cannot stay in the cradle forever.'[1]

Konstantin Tsiolkovsky, Soviet space pioneer (1911)

'The United States will lead the return of humans to the Moon for long-term exploration and utilization, followed by human missions to Mars and other destinations.'[2]

Donald Trump, President of the United States of America (2017)

'It's not going to be a vacation jaunt.'[3]

Elon Musk, founder and CEO of Space Exploration Technologies ('SpaceX') (2014)

The prospect of humanity becoming an 'interplanetary species'[4] is shifting from the realm of science fiction to science fact. The growth of the global space sector in the last 20 years, spurred by the competitiveness of telecommunications industries, has led to increased investment in satellite and launch technology. Governments and entrepreneurs alike are

[1] From an undisclosed letter in 1911, quoted in Fountain, L M, 'Creating Momentum in Space: Ending the Paralysis Produced by the Common Heritage of Mankind Doctrine' (2003) 35 *Connecticut Law Review* 1753, 1753.

[2] Donald Trump, 'Reinvigorating America's Human Space Exploration Program' (Presidential Memorandum, 11 December 2017) <https://www.whitehouse.gov/presidential-actions/presidential-memorandum-reinvigorating-americas-human-space-exploration-program/> (date accessed: 18 February 2018).

[3] Andersen, R, *Exodus* (30 December 2014) Aeon <https://aeon.co/essays/elon-musk-puts-his-case-for-a-multi-planet-civilisation> (date accessed: 18 February 2018).

[4] Musk, E, 'Making Humans a Multi-Planetary Species' (2017) 5(2) *New Space* 46, 49.

starting to see the potential to harness and repurpose this technology in aid of a loftier goal: that of taking human beings to Mars. The private sector has seized the initiative from national space agencies, developing plans that anticipate human presence on Mars by 2030. These plans anticipate the first human settlers undertaking a one-way trip; setting up a new life on Mars and harvesting water and mineral resources to sustain a population. Such plans, coming as they are from technologists, are typically technical in nature; issues of law, governance, health and environment are relegated for later consideration. For the international lawyer, however, an obvious question arises. Would the creation and conduct of a human settlement on Mars, with its implications of permanence and resource-use, comply with international law?

In order to answer this broad question, it is necessary first to establish the nature and content of law as it applies in outer space. In this introduction, I will outline the development of international space law. It is a small but dynamic field. Given the breadth of my research question, I will also set out the assumptions on which this paper will proceed. Finally, I set out some resource challenges faced while writing this paper, and how I have accommodated them.

A NATURE AND CONTENT OF INERNATIONAL SPACE LAW

Much like other branches of public international law, space law has its origins in the need to establish clear and simple rules to govern relations between members of an increasingly organised international community. While scientists, philosophers and creatives have long turned their attentions to outer space, there 'was no legal dimension to this sphere'.[5] With the appearance of new technologies in the mid-20th century, especially rocket technology first used in WWII, air law specialists began turning their attentions to the public and private law issues this innovation might raise. A powerful drive towards creating a new branch of international space law came from geopolitical considerations. In the late 1950s the military competition between rival superpowers of USA and USSR, characterised by the rapid development of nuclear arms, seemed poised to extend into outer space. In 1957 the USSR launched the first man-made object into outer space. For complex political, economic and

[5] Jankowitsch, P, 'The background and history of space law' in von der Dunk, F and Tronchetti, F *Handbook of Space Law* (Edward Elgar Publishing, Incorporated, 2015), 1.

technological reasons, however, this realm of competition remained peaceful – a civilian 'space race'.

A number of international agreements and guidelines for the use of outer space characterise the first phase of space law development. A bilateral agreement known as the 1963 *Partial Test Ban Treaty* (subsequently UNGA resolution) was concluded establishing that outer space remain free of nuclear weapons and other weapons of mass destruction.[6] This was quickly followed in 1967 by the *Outer Space Treaty*[7] establishing international principles for the peaceful exploration of outer space,[8] for the common benefit of all mankind.[9] The signing and entry into force of the *Outer Space Treaty* signified the ambitious creation of an entirely new branch of public international law. Unlike the continents and seas 'discovered' by European empires in previous centuries, outer space was not to be subject to national appropriation.[10] Unlike the high seas, which had long been a theatre of war, outer space was to be reserved for 'peaceful purposes'.[11] A follow up treaty known as the 1979 *Moon Agreement*[12] was even more expansive, designating the moon and its natural resources as the 'common heritage of mankind'.[13] This treaty is considered a failure as it has not been ratified by any major space-faring nation.[14]

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[6] *Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water*, done 5 August 1963, entered into force 10 October 1963, 480 UNTS 43; *Question of general and complete disarmament*, UNGA Res. 1884(XVIII), of 17 October 1963; UN Doc. A/RES/18/1844.

[7] *Treaty on the Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, done 27 January 1967, 610 UNTS 205 ('Outer Space Treaty'). As of January 2017, 105 countries are parties to the treaty, while another 24 have signed the treaty but have not completed ratification.

[8] *Outer Space Treaty* preamble, arts III-IV.

[9] *Outer Space Treaty* art I.

[10] *Outer Space Treaty* arts preamble, art II.

[11] *Outer Space Treaty* preamble, Art IV.

[12] *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, done 18 December 1979, entered into force 11 July 1984, 1363 UNTS 3 ('*Moon Agreement*'). As of November 2016, it has been ratified by 17 states.

[13] *Moon Agreement* art XI.

[14] Jankowitsch, P, above n. 5, 6.

The second phase of space law development was the negotiation and entry into force of three other space treaties:

- 1968 *Rescue Agreement*:[15] elaboration of principles in Article V *Outer Space Treaty* on the rights and obligations of States concerning the rescue of persons in space.
- 1972 *Liability Convention:*[16] the launching State bears absolute liability for damage caused by its space object on Earth or in flight.
- 1975 *Registration Convention:*[17] implementation of principles in Article VIII *Outer Space Treaty* requiring states to furnish to the United Nations with details about the orbit of each space object.

The third phase of space law development has been a more proliferation of 'soft law'; various non-binding rules developed in bilateral agreements (especially by the United States), non-legal agreements between major space agencies such as NASA and ESA, and UN General Assembly resolutions.[18] This web of State practice effectively establishes a code of conduct which plays a role in setting the basis for future treaty negotiations.

Some authors argue that a fourth phase of space law is yet called for; 'hard law' in the fields of security and safety of space operations which need a guarantee of long-term sustainability and juridical certainty. It is argued that new rules and regulations require the legitimacy and universality that can only be provided by the United Nations. Further, space law instruments, foremost of which the *Outer Space Treaty,* are State-centric; establishing a system of State responsibility, authorisation and liability for all activities. The rapid growth of commercial space industries presents real challenges to this regime as States look to incentivise non-State actors to adopt the costly and risky business of space exploration.

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[15] *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space,* done 22 April 1968, entered into force 3 December 1968, 672 UNTS 119 ('*Rescue Agreement*').

[16] *Convention on International Liability for Damage Caused by Space Objects*, done 29 March 1972, entered into force 1 September 1972, 961 UNTS 187 ('*Liability Convention'*).

[17] *Convention on Registration of Objects Launched into Outer Space,* done 14 January 1975, entered into force 15 September 1976, 1023 UNTS 15 ('*Registration Convention'*).

[18] Jankowitsch, P, above n. 5, 27.

B THE QUESTION TO BE ANSWERED

Broadly, the question to be answered is whether the creation and conduct of a human settlement on Mars would comply with international law. I break the question down as follows:

> Chapter II: Does the establishment and conduct of a human settlement fall within the *freedom of activities* anticipated in Article I *Outer Space Treaty*?
>
> Chapter III: Does Article I oblige settlers to share the profits (if any) of their activities with Earth?
>
> Chapter IV: Does the establishment of the settlement constitute an appropriation within the terms of Article II *Outer Space Treaty*?
>
> Chapter V: Are settlers entitled to exclude others from the settlement?

C ASSUMPTIONS

The framing of this paper requires the exercise of a little imagination. Despite rapid technological progress, no human settlement has been established outside Earth. The International Space Station is the closest existing analogy; however it is of limited assistance in an enquiry into the state of law on Mars because it is regulated by a multi-lateral treaty and other agreements between the participant states.[19]

For the purposes of this paper, the question of *who* settles Mars is an important one. As discussed above, the private sector is playing a crucial role in the development of technology, and the expression of concrete plans. While they may go it alone, Musk has recently speculated that 'ultimately this is going to be a huge public-private partnership.'[20] There is some debate

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[19] *Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, The Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station,* done 29 January 1998, entered into force 27 March 2001, TIAS no 12927; Cm 4552; see generally Von der Dunk, F, 'International Space Law' in Von der Dunk, F and Tronchetti, F, *Handbook of Space Law* (Edward Elgar Publishing, Cheltenham, 2015) 114.

[20] Musk, above n. 4, 57.

in space law literature about the extent to which private actors are bound by the *Outer Space Treaty;* accordingly to what extent the constraints imposed on activity and ownership in space might apply to Musk and his competitors. For the purposes of this paper, however, I rely on Article VI *Outer Space Treaty* as the determinative rule. Article VI provides:

> States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on my governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorisation and continuing supervision by the appropriate State Party to the Treaty.[21]

I discuss the import of this provision in detail in Chapter IV. For the purposes of the whole paper, I assume that private operators and other non-governmental entities are bound by the *Outer Space Treaty* to the same extent as the State of that organisation's registration. A question that I do not address in this paper is whether non-governmental operators may operate under a 'flag of convenience' in order to avoid the operation of the treaty. It is outside the scope of this paper to consider the question of whether the treaty is *jus cogens*, and accordingly not vulnerable to that strategy – for the reasons discussed in section D below.

D SOURCE LIMITATIONS

I have been limited in the research for this paper to resources available through the library of the University of Cape Town, as well as searches carried out on my behalf by peers at the Australian National University and institutions in the UK, US and Turkey. None of these institutions have full access to the records of the proceedings of the annual colloquia of the International Institute of Space Law or recent editions of the *Journal of Space Law*. Understandably, this posed a significant challenge to my research, as the papers published in these fora explain and discuss the latest developments in State practice. Accordingly, I determined to limit the scope of my research to a textual analysis of the relevant treaty law. I draw on the travaux préparatoires for the *Outer Space Treaty* and *Moon Agreement* as

[21] *Outer Space Treaty* art VI.

evidence of subsequent conduct in aid of the interpretation of those treaties. Limited reference is made to state practice where available, but such reference is not intended to fully represent the current state of law.

II DOES ART I FREEDOM OF ACTIVITIES PERMIT A MARS SETTLEMENT?

A INTRODUCTION

Article I *Outer Space Treaty* provides:

> The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for *the benefit and in the interests of all countries*, irrespective of their degree of economic or scientific development, and *shall be the province of all mankind.*
>
> Outer space, including the Moon and other celestial bodies, shall be *free for exploration and use by all States* without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.
>
> There shall be *freedom of scientific investigation* in outer space, including the Moon and other celestial bodies, and States shall facilitate and encourage international co-operation in such investigation.[22] (emphasis added)

Two distinct, though related, concepts emerge: the degree of freedom of activities in outer space, and the distribution of the benefits of those activities. These two concepts are often conflated in the context of ongoing debates over the legality of asteroid mining. Analysis of the plain language of Article I is often overlooked in favour of a combined reading Article I and II through the lens of the 'common heritage of mankind' principle, developed in the *Moon Agreement* and *United Nations Convention of the Law of the Sea*.[23] In this chapter, I analyse the language of Article I in order to determine whether actors are free to establish a human settlement on Mars. In Chapter III, I explore the extent to which profits must be shared among the States Parties.

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[22] *Outer Space Treaty* art I.

[23] *United Nations Convention of the Law of the Sea*, opened for signature 10 December 1982, entered into force 16 November 1994, 1833 UNTS 3

In order to answer this question, I examine the ambiguity of certain words and phrases in Article I. In particular, I examine the concepts of 'freedom', 'use' and the 'province of mankind'. I draw on the *Vienna Convention on the Law of Treaties*[24] as an interpretative guide. Even though the *Outer Space Treaty* pre-dates the entry into force of the *Vienna Convention on the Law of Treaties* in 1980, it is well-established that the content of Arts 31 and 32 reflect pre-existing customary international law, and accordingly may be applied in its interpretation.[25] This also permits its application even though not all parties to the *Outer Space Treaty* are parties to the *Vienna Convention on the Law of Treaties*.[26] The interpretative exercise requires examination of the 'ordinary meaning' of the word or phrase, its use in context, any related or subsequent agreements, and the object and purpose of the treaty.[27] If the meaning of the phrase remains ambiguous despite this analysis, Article 32 *Vienna Convention on the Law of Treaties* allows recourse to supplementary means of interpretation, such as the *travaux préparatoires*. These elements are considered in 'a single combined operation'[28] in a manner 'more an art than a science'.[29]

Article I paragraphs 2 and 3 provide that a celestial body, such as Mars, is 'free' for exploration, use, and scientific investigation. In the case of scientific investigation, international co-operation is to be facilitated and encouraged by States. This section explores the content of this freedom and considers whether the establishment of a human settlement falls within the permitted range of activities.

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[24] *Vienna Convention on the Law of Treaties,* opened for signature 23 May 1969, entered into force 27 January 1980, 1155 UNTS 331.

[25] *Arbitration regarding the Iron Rhine ('Ikzeren Rijn') Railway (Belgium v Netherlands* (Award) (2005) 27 RIAA 35 [45].

[26] Crema, L, 'Subsequent Agreements and Subsequent Practice within and outside the Vienna Convention' in Nolte G [ed] *Treaties and Subsequent Practice* (Oxford University Press, 2013) 10.

[27] *Vienna Convention on the Law of Treaties* art 31.

[28] International Law Commission, 'Draft Articles on the Law of Treaties with Commentaries' (1966) 2 *ILC Yearbook* 219.

[29] Ibid.

B WHAT IS 'FREEDOM'

The term 'freedom' in Article I paras 2 and 3 is an allusion to the *Lotus principle*, being that States are by default free to act, and that 'restrictions on the independence of [the State] cannot […] be presumed'.[30] Accordingly, 'freedom' in this context means that a State is entitled to use, explore or scientifically investigate without seeking permission from other States or an international coordinating body, such as the United Nations.[31] This section explores the extent to which States are free to act in space; and accordingly, the activities of private actors that they may permit and regulate.

C IS SPACE SETTLEMENT 'EXPLORATION', 'INVESTIGATION' OR 'USE'?

It is unclear whether the establishment of a human settlement and its ongoing maintenance might fall within the meaning of 'exploration', 'investigation' or 'use' in Article I paras 2 and 3. A space settlement would require the construction and placement of installations on the surface of the celestial body, using a combination of materials brought from Earth and recovered from the settlement site.[32] Settlers would conduct scientific experiments and attempt agriculture.[33]

The definitions of 'exploration' and 'investigation' are not debated in scholarly works or in the *travaux préparatoires.* 'Exploration' is understood to constitute activities aimed at 'the discovery of something new or yet unknown'[34] and may include 'activities that aim at the discovery of resources which can eventually be exploited'.[35] 'Scientific investigation' is more

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[30] *S.S. 'Lotus' (France v Turkey) (Judgment)* [1927] PCIJ (Ser A) No 10, 18.

[31] Hobe, S and Chen, K, 'Legal status of outer space and celestial bodies' in Ram, S J and Dempsey, P S [eds], *Routledge Handbook of Space Law* (Routledge, United Kingdom, 2017) 25.

[32] Musk, above n. 4, 49.

[33] Moskowitz, C, 'Farming on Mars: NASA Ponders Food Supply for 2030s Mission' (May 2013) s*pace.com* <https://www.space.com/21028-mars-farming-nasa-missions.html> (date accessed: 18 February 2018); Gordan, G, 'Can Plants Grow With Mars Soil?' (August 2017) *NASA.com* https://www.nasa.gov/feature/can-plants-grow-with-mars-soil (date accessed: 18 February 2018).

[34] Hobe and Chen, above n. 31, 31.

[35] Ibid, 32.

specific, being activities aimed at gaining knowledge about these discovered objects or areas.[36] The establishment and maintenance of a human settlement on Mars would involve a number of activities, such as rover missions and on-base experiments, which fall neatly into the categories of 'exploration' and 'investigation'. Article I clearly permits States to pursue such activities. However, the construction of surface settlements, the conduct of agriculture and the conversion of space resources into fuel or consumables are less obvious.

The definition of the third category of activity, 'use', is more vague and, as a result, has been contested.[37] Does the concept of 'use' extend to exploitation or extraction of space resources? Even before the treaty's conclusion, this was a contentious issue. This question was raised by the representative of France during the *Outer Space Treaty* debates, Mr Deleau:

> Did the […] term imply use for exploration purposes, such as the launching of satellites, or did it mean use in the sense of *exploitation*, which would involve for more complex issues? Space, of course, was already being used for meteorological research and telecommunications, but in the case of celestial bodies it was hard at present to conceive of utilizing the *Moon*, say, for the *extraction* of minerals.[38] (emphasis added)

The Soviet perspective, offered by representative Mr Morozov in response to Mr Deleau, was that the treaty

> could deal only with the problems arising at the current stage of human evolution, and future developments would give rise to new problems requiring subsequent solution. But it would be unwise to look too far ahead and to attempt to prescribe rules for

[36] Ibid, 32.

[37] Myers, J, 'Extraterrestrial Property Rights: Utilizing the Resources of the Final Frontier Comments' (2016) 18 *San Diego International Law Journal* 77, 91; Tronchetti, F, 'Legal aspects of space resource utilization' in Von der Dunk, F and Tronchetti, F (eds), *Handbook of Space Law* (Edward Elgar Publishing, Inc, 2015) 781.

[38] *LSC Summary Records*, UN GAOR, 2nd comm, 5th sess, 63rd mtg, UN doc A/AC.105/C.2/SR.63 (16 July 1966) 8 (France).

> situations on which it was impossible to form adequate judgment at the present stage.[39]

While the legality of space resource exploitation is very much contested,[40] this debate is entirely directed at commercial resource extraction and generally centres around the legal status of celestial bodies under the 'province of mankind' principle and the Article II ban on appropriation.[41] While the construction and maintenance of a space settlement is anticipated to require some extracted resources (rocks and minerals for building materials, water for consumption and fuel),[42] other aspects such as agriculture and construction can more easily be understood as 'use' activities.

While this use case is not considered in the leading academic works, the distinction between 'use' and 'exploitation' has been considered. Von der Dunk observes that while at the time of drafting the *Outer Space Treaty* the possibility of exploitation of celestial bodies for activities such as communications using satellites was not substantially taken into account, 'it has meanwhile generally been agreed that 'use' in this context also includes such 'exploitation'.'[43] Cheng, cited with approval by Hobe and Chen, endorses a generally broad interpretation of the concept of 'use', to encompass 'all activities intended for space […] including Earth-based operations.[44] I conclude, all elements considered, that classification of activities related to the establishment and maintenance of a Mars settlement as 'use' is unlikely to be considered problematic.

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[39] *LSC Summary Records*, UN GAOR, 2nd comm, 5th sess, 63rd mtg, UN doc A/AC.105/C.2/SR.63 (16 July 1966) 10 (USSR).

[40] Tronchetti, 'Legal aspects of space resource utilization', above n. 37, 769, citing Tronchetti, F, *The Exploitation of Natural Resources of the Moon and Other Celestial Bodies: A Proposal for a Legal Regime* (Martinus Nijhoff Publishers, 2009); see generally Pop, V, 'Appropriation in Outer Space: The Relationship Between Land and Ownership and Sovereignty on the Celestial Bodies' (2000) 16 *Space Policy* 275.

[41] Discussed in Chapter IV.

[42] Musk, E, above n. 4, 49.

[43] Von der Dunk, above n. 19, 57.

[44] Hobe and Chen, above n. 31, 32 citing Bin Cheng 'Revisited: International Responsibility, National Activities and the Appropriate State' (1998) 27 *Journal of Space Law* 19.

D CLARITY IN THE MOON AGREEMENT?

The *Moon Agreement* was considered and elaborated by the Legal Subcommittee of Committee on the Peaceful Uses of Outer Space ('COPUOS') between 1972 to 1979, was adopted by the UN General Assembly in 1979 and entered into force in 1984. The treaty was an elaboration of some of the key principles contained in the *Outer Space Treaty*, particularly as they applied to celestial bodies[45]. In particular, the treaty explicitly anticipates and permits the establishment of manned space stations on and below the surface of celestial bodies. Article VIII(2)(b) provides that 'States Parties may … [p]lace their personnel, space vehicles, equipment, facilities, stations and installations anywhere on or below the surface of the Moon.'[46] Art IX(1) provides that 'States Parties may establish manned and unmanned stations on the *Moon*. A State Party establishing a station shall use only that area which is requirement for the needs of the station.'[47] This freedom is constrained by the requirement not to interfere with the activities of other States Parties,[48] to inform the Secretary-General of the UN of the location and purposes of that station[49] and to be 'installed in such a manner that they do not impede free access to all areas of the Moon'.[50]

This apparent clarity does not wholly resolve the question of whether a human settlement of Mars is permissible in international law. As discussed elsewhere in this paper, while the *Moon Agreement* did enter into force in 1984, in practice it is considered a failed treaty. This is because it has not been ratified by any major space-faring country. To date, it has been signed or acceded to by only 18 states.[51] Accordingly, while a State Party to the *Moon Agreement* may

[45] *Moon Agreement* art I para 1 'provisions of this agreement relating to the Moon shall also apply to other celestial bodies within the solar system except the Earth'.
[46] *Moon Agreement* art 8(2)(b).
[47] *Moon Agreement* art 9(1).
[48] *Moon Agreement* art 8(3).
[49] *Moon Agreement* art 9(1).
[50] *Moon Agreement* art 9(2).
[51] United Nations Office for Disarmament Affairs, 'Agreement Governing the Activities of States on the Moon and Other Celestial Bodies: Status of the Treaty (January 2018) <http://disarmament.un.org/treaties/t/Moon> (date accessed: 18 February 2018).

purport to rely on these provisions in an eventual establishment of a human settlement on Mars, in practice they carry little weight.

The next question, therefore, is whether the *Moon Agreement* and its *travaux préparatoires* may be considered 'subsequent practice' that 'establishes the agreement of the parties' to the *Outer Space Treaty* per Article 31(3) *Vienna Convention on the Law of Treaties*. If so, it may be used as a tool to interpret the terms 'freedom' and 'activities' discussed in this section. In my view, the *Moon Agreement* cannot be said to be practice that reflects the agreement of the parties. While it was intended to elaborate and reaffirm the principles of the *Outer Space Treaty*, including freedom of activities,[52] the failure of the treaty to attract the support of the major space-faring nations such as the USA and Russia, and only 18 ratifications to the *Outer Space Treaty*'s 105,[53] must disqualify it from this status.

E CONCLUSION

In this chapter, I asked whether the freedom of activities in Article I *Outer Space Treaty* is sufficiently broad to permit the establishment and conduct of a human settlement on Mars. I conclude that it likely is. While the building of a station or other installation using resources brought from Earth falls squarely within the definition of 'use', it is other activities associated with the maintenance of a settlement that involve the exploitation or extraction of resources that give pause. The *Moon Treaty* does not determine the question either way. Absent future agreement to define the term 'use' and regulate the exploitation of resource, state practice will determine the threshold for acceptable activity. As asteroid mining becomes feasible and widely practiced, this will be a valuable source of evidence for states' understanding of the limitations of Article I.

[52] *Moon Agreement* preamble.

[53] United Nations Office for Disarmament Affairs, 'Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies: Status of the Treaty' (December 2016) <http://disarmament.un.org/treaties/t/outer_space> (date accessed: 18 February 2018).

III CAN THE SETTLEMENT MAKE A PROFIT?

Article I paragraph 1 of the *Outer Space Treaty* is framed as a single sentence, but contains two discrete provisions:

(1) That the 'exploration and use' of outer space and celestial bodies 'shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development', and
(2) That the 'exploration and use' of outer space and celestial bodies 'shall be the province of all mankind'.[54]

The precise import of these provisions is a matter of ongoing controversy, both as to their content and their force. Does their combined reading mean that profits and resources derived from space activities should be distributed equally among all States? Is it a definitive guiding principle of space law, or is it a merely aspirational statement, its vagueness deliberately designed to facilitate later negotiations? In this section, I outline the various positions taken over the course of the treaty negotiations and subsequent developments in the law and assess their merits by means of Article 31 *Vienna Convention on the Law of Treaties* analysis. In particular, I ask what 'province of mankind' means – and is it the same as the concept of 'common heritage of mankind', found in the *Moon Agreement* and the *United Nations Convention on the Law of the Sea*?

A AMBIGUITY OF TERMS

1 ORIGINAL MEANING: 'PROVINCE OF MANKIND'

The phrase 'province of mankind' is unique to the *Outer Space Treaty*; it has not found expression in international instruments before or since. It was introduced in the 1966 Soviet draft of Article I paragraph 1 of the treaty, the language of which was adopted almost exactly.[55] Rana observes that the 'frenetic environment' in which space law has developed, as well as the

[54] *Outer Space Treaty* art I.
[55] Gabrynowicz, J I, 'The 'Province' And 'Heritage' Of Mankind Reconsidered: A New Beginning' (Paper presented at the 2nd Conference on Lunar Bases and Space Activities, Houston, Texas, 5-7 April 1988) 691.

'vagueness' of the specific phrase, has 'given rise to volumes of competing definitions, arguments and positions regarding the legal ramifications of the mankind provisions'.[56] The practical result of this has been the 'failure to articulate, internationally, the legal substance of these subjects.'[57] In an analysis of the strategy of semantics in the *Outer Space Treaty*, German scholar Bueckling laments that the 'generalised formulas used in space law' are of such 'poor and inadequate substance' that 'the law is bound to go off-course on the ocean of facts'.[58] Its meaning was questioned during negotiations by representatives of the United Kingdom,[59] Cyprus,[60] Italy,[61] France[62] and India.[63] Mr Darwin of the UK is reported as having 'had some difficulty in understanding the phrase 'the province of all mankind' in the first sentence of Article I of the Soviet text'.[64]

The term 'mankind' as a subject of the provision is particularly troublesome. Bueckling asserts that the use of the term 'immerses the entire scene of outer space in the ethereal light of a lofty humanity' which 'conceal[s] reality in that they speak of a harmonious world, while leaving the numerous conflicts of interest largely unsolved'.[65] 'Mankind' carries multiple meanings – a social or legal system centred on the individual; a group of peoples, States or groups of States;

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[56] Rana, H S, 'The Common Heritage of Mankind &(and) the Final Frontier: A Revaluation of Values Constituting the International Legal Regime for Outer Space Activities Note' (1994) 26 *Rutgers Law Journal* 225.

[57] Ibid, 225.

[58] Bueckling, Adrian, 'The Strategy of Semantics and the 'Mankind Provisions' of the Space Treaty' (1979) 7 Journal of Space Law 15, 17.

[59] *LSC Summary Records*, UN GAOR, 2nd comm, 5th sess, 63rd mtg, UN doc A/AC.105/C.2/SR.63 (16 July 1966) 9 (United Kingdom).

[60] *GA Verbatim Records*, UN GAOR, 1st comm, 21st sess, 1493rd mtg, UN doc A/C.1/SR.1493 (17 December 1966) 43 (Cyprus).

[61] *LSC Summary Records*, UN GAOR, 2nd comm, 5th sess, 64th mtg, UN doc A/AC.105/C.2/SR.64 (21 July 1966) 4-5 (Italy).

[62] *LSC Summary Records*, UN GAOR, 2nd comm, 5th sess, 64th mtg, UN doc A/AC.105/C.2/SR.64 (21 July 1966) 6 (France).

[63] *LSC Summary Records*, UN GAOR, 2nd comm, 5th sess, 63rd mtg, UN doc A/AC.105/C.2/SR.63 (16 July 1966) 11 (India).

[64] *LSC Summary Records*, UN GAOR, 2nd comm, 5th sess, 63rd mtg, UN doc A/AC.105/C.2/SR.63 (16 July 1966) 9 (United Kingdom).

[65] Bueckling, above n. 58, 18.

or a 'politically-ideologically oriented composite body'.[66] Which of these meanings is intended by the drafters is unclear. Mankind is not, in any event, a defined subject of international law. This issue was raised during treaty negotiations, for example by the representative for Cyprus who observed that 'the treaty went beyond international law and the Charter, which regarded nations as independent sovereign agents, whereas the treaty saw mankind as a single entity.'[67] A review of the *travaux préparatoires* indicate that despite questions being raised, the definition of 'mankind', and its status as a subject of international law, was not agreed at this time.

The term 'province' is not subjected to the same scrutiny in the academic literature or in the *travaux préparatoires*. It is unclear, however, what sense of the word was intended by the drafters. 'Province' carries two meanings in the English language – the literal sense being a 'a territory, region, or subdivision', and a more figurative sense being 'a sphere of action, influence, or responsibility; the proper function or area of concern of a particular person or group.'[68] Recall that Article I paragraph 1 provides that it is the 'exploration and use' of outer space and celestial bodies that 'shall be the province of all mankind' – *not* that outer space and celestial bodies are *themselves* the 'province of mankind'. The former reading invokes the 'sphere of action' meaning of 'province'; the latter invokes the territorial meaning. Taking this into account, my view is that the more correct reading of the provision is that 'activities in outer space and on celestial bodies is a proper area of concern and responsibility for mankind'.

2 ASPIRATIONAL OR BINDING?

'Province of mankind', read this way, is purely declaratory, and basically meaningless. This view is shared by the scholarly sources such as Goldman, Rana and Myers, who each assert that it is

[66] Ibid, 18.

[67] *GA Verbatim Records*, UN GAOR, 1st comm, 21st sess, 1493rd mtg, UN doc A/C.1/SR.1493 (17 December 1966) 43 (Cyprus).

[68] Oxford English Dictionary, 'Province, noun' (September 2007) <www.oed.com> (subscription service) (date accessed: 18 February 2018).

a 'Statement of aspiration, rather than an enforceable rule'.[69] Cheng concludes that the *travaux préparatoires*

> clearly show that its draftsmen hardly intended this part of Article 1 to be anything more than a declaration of principles from which no specific rights of a legal nature were to be derived.[70]

Although not specifically stated, this may have been the reasoning of the representative for India, who 'expressed some doubt as to whether [the article] dealt with a specific legal obligation' and, therefore, 'whether its inclusion in the body of the text was warranted'.[71] This was echoed by the representatives for Italy and France who suggested that the entire text of Article I paragraph 1 be placed in the preamble, rather than the body of the treaty. This view has also been expressed after the entry into force of the treaty. Bueckling reports that the opinion of the Soviet delegation, expressed in a UN working paper from later negotiations over the Moon Agreement was that 'province of mankind' carries no substantive significance.[72] Myers reports that the United States representative to the Legal Subcommittee of COPUOS stated in a hearing before the Committee on Foreign Relations of the US Senate that Article I represents a 'goal', that is not a 'free ride' for non-contributing countries.[73]

B SUBSEQUENT STATE PRACTICE: HAS THE MEANING OF ARTICLE I CHANGED?

As discussed earlier in this chapter, Article 31(3) *Vienna Convention On The Law Of Treaties* provides that 'subsequent practice' of parties to a treaty 'which establishes the agreement of the parties' may be used to interpret a treaty.[74] Accordingly, a critical question is whether in the 50 years since the entry into force of the treaty, any new agreement has been reached by

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[69] Goldman, N C, *American Space Law: International and Domestic* (Iowa State Publishers, 1 ed, 1996), 70; Rana above n. 56, 229; Myers above n. 37, 91.

[70] Cheng, above n. 44, 234.

[71] *LSC Summary Records*, UN GAOR, 2nd comm, 5th sess, 63rd mtg, UN doc A/AC.105/C.2/SR.63 (16 July 1966) 11 (India).

[72] Bueckling, above n. 58, 19. The citation provided by Bueckling at footnote 27 could not be verified.

[73] Myers, above n. 37, 91.

[74] Kohen, M, 'Keeping Subsequent Agreements and Practice in Their Right Limits' in Nolte, G (ed), *Treaties and Subsequent Practice* (Oxford University Press, 2013) 34.

the parties as to the meaning of Article I paragraph 1. While there is no proscribed list of conduct which might be considered 'subsequent practice', Kohen cautions against including 'all sorts of acts' such as resolutions of international organisations, judicial decisions and policy positions – it is preferable to understand subsequent practice as referring to conduct by the parties 'in the implementation of the treaty'.[75] The practice must reflect a shared understanding of the meaning of the treaty. As the ICJ explained in the *Kasikili/Sedudu Island* case,[76] unilateral conduct or expressions of interpretation cannot automatically amount to subsequent practice. Further, it is only the practice of States that should be taken into consideration. Even though the *Outer Space Treaty* affects the activities of private entities and non-State organisations, their conduct can only 'serve as a catalyst'[77] for States Parties. To borrow Kohen's analogy of a fisherman or investor, what is decisive is not what a space entrepreneur does, but the reaction of the parties to the treaty that counts as 'subsequent practice'.[78]

The views of the States Parties to the *Outer Space Treaty* have been expressed in a number of ways since its inception; the question of whether such expressions constitute sufficient agreement for the interpretation of Article 1 paragraph 1 is contested. In this section, I examine the development of the 'common heritage of mankind' principle and its contested application to the *Outer Space Treaty*. As sources of 'subsequent practice' I rely primarily on the records of the debates of the *Moon Agreement*, and the records of COPUOS.

In the two decades following the coming into force of the *Outer Space Treaty*, two interpretations of Article I paragraph 1 emerged from the States Parties and scholars to challenge the notion discussed earlier in this chapter that the provision is of no substantive effect. One interpretation is that space and celestial bodies are the 'common heritage of mankind'; the second is that space and celestial bodies are 'global commons'. Von der Dunk sets out the key definitional differences between global commons and 'Common Heritage Of

[75] Ibid 34 citing Boisson de Chazournes, L, 'Qu'est-ce que la Pratique en Droit International?' in SFDI *La Pratique et le Droit International* (Pedone, 2004) 13-47.
[76] *Kasikili/Sedudu Island (Botswana/Namibia)* (Judgment) [1999] ICK Rep 1045, [52]-[70], [79].
[77] Ago, R, 'Fourth Report on State Responsibility' (1972) 2 *ICL Yearbook* 97, [65].
[78] Kohen, above n. 74, 41-42.

Mankind' as expressed in Article XI *Moon Agreement*.[79] Outer space as global commons is defined by the fundamental freedom for individual States to act, unless specific international obligations that constrain this freedom are agreed upon. The provisions of the *Outer Space Treaty* and the widely-accepted *Liability Convention*[80] are examples of such agreed constraints. 'Common heritage of mankind', as expressed in the *Moon Agreement*, carries the presumption that activities, in particular exploitation activities, are only permissible where explicitly authorised by the legal regime.[81]

While the breakdown of these positions is typically described as being between newcomer non-space-faring and developing countries, and the so-called 'space powers', I will describe the flaws in that description. In this section I outline how these positions came to be held, and by whom; which (if either) might be considered most accurate; and the implications for profit and resource sharing for the human settlement on Mars.

1 'COMMON HERITAGE OF MANKIND'

(a) ACCESSION OF NEW STATES AND RESULTANT SHIFTS:

The 1970s saw an explosion of growth in the number of countries acceding to the *Outer Space Treaty* and participating in other multi-lateral treaty negotiations, particularly newly decolonised and developing countries. Robinson and White describe how some of these countries 'collectively evolved the opinion that since most international law developed prior to their attaining nationhood status, they were not generally bound by its tenets.'[82] These countries argued that they were free to define international law as it applied to them.[83] When it came to defining 'province of all mankind' and interpreting Article I *Outer Space Treaty*, they asserted that it meant that all nations had vested rights in common resources and should be

[79] Von der Dunk, 'International Space Law', above n. 19, 57-58.

[80] Committee on the Peaceful Uses of Outer Space, 'Status of International Agreements relating to activities in outer space as at 1 January 2017' UN GAOR 2nd comm, 56th sess, UN doc A/AC.105/C.2/2017/CRP.7 (23 March 2017).

[81] *Moon Agreement* art XI.

[82] Robinson, G S and White, H M, *Envoys of Mankind – A Declaration of First Principles for the Governance of Space Societies* (Smithsonian Institution, Washington DC, 1986) 187.

[83] They did, however, accept the *Charter of the United Nations*. See Tronchetti in Handbook of Space Law pge X

shared equitably among them.[84] They asserted that the common resources require common management, and should be distributed between all countries regardless of who participated in the exploitation or extraction.[85]

It was not until negotiations over the *United Nations Convention of the Law of the Sea* were underway that this interpretation came to be described as the 'common heritage of mankind'. It was later included in Article 1 paragraph 1 of the *Moon Agreement*, which reads 'the Moon and its natural resources are the common heritage of mankind which finds expression `in the provisions of this Agreement, in particular in paragraph 5 of this article'.[86] The underlying premise of the 'common heritage of mankind' doctrine is that property belongs to all people or peoples of all States.[87] Fountain, citing Joyner, defines five elements generally considered central to the doctrine: that the area is not subject to national appropriation, all States share in the management of the area, the benefits of exploitation of resources in the area are to be shared with all, the area is to be dedicated to peaceful purposes, and it is to be preserved for future generations.[88] These elements fit neatly within the existing framework of the *Outer Space Treaty*, which already contains a ban on national appropriation (Article II) and reserves outer space for 'peaceful purposes' (preamble). Bueckling, in his essay on the semantic origins of what he terms the 'mankind provisions' considers that the notion of heritage evokes an 'ancient human norm' – being that an heir is entitled to acquire, foster, increase and exploit an inheritance.[89]

(b) WHAT WOULD 'COMMON HERITAGE OF MANKIND' MEAN IN PRACTICE?

'Common heritage of mankind' is a very unpopular concept with space-faring countries and the space industries operating within their jurisdictions. If outer space is the 'common heritage of mankind', celestial bodies and resources belong to all countries equally; accordingly any

[84] Tronchetti, 'Legal Aspects of Space Resource Utilization', above n. 37, 785.
[85] Rana, above n. 56, 230-231.
[86] *Moon Agreement* art I.
[87] Von der Dunk, 'International Space Law' above n. 19, 196.
[88] Fountain, above n. 1, 1759 citing Joyner, C, 'Legal Implications of the Concept of the Common Heritage of Mankind' (1986) 35 *International and Comparative Law Quarterly* 190, 191-92.
[89] Bueckling, above n. 58, 21.

benefit derived from space activities must be distributed equitably. This means that while participants in space industry are permitted to profit from their activities, those profits must be split up among all the States Parties to the *Outer Space Treaty*. It effectively functions as a tax on the successful exploitation of resources.

The doctrine is perceived by space industry participants as an unfair divestment of the profits of private labour; rendering investment in space development risky and unprofitable. Pop describes the outcome for non-space-faring countries as 'reaping without sowing'.[90] Fountain deems it a 'socialistic means for redistributing wealth' that is 'at odds with the free-market mentality that now pervades the global economy'.[91] The regime 'fails to provide economic return on one's investment'[92] that will diminish profits.[93] Assuming that development of space is a positive thing, many legal and political commentators argue that 'common heritage of mankind' should be eschewed because investors need to have a significant profit motive in order to do so.[94] Of course, the flip side of this argument is that developing countries would obtain access to a new stream of resources to fund the development of their own space industries, which could have positive follow-on effects for development generally.

'Common heritage of mankind' also means that an international regime would be required to establish the basis upon which exploitation could take place, such exploitation being bound by

[90] Pop, V, *Who Owns the Moon? Extraterrestrial Aspects of Land and Mineral Resources Ownership* (Springer, Netherlands, 2008) 121-134.
[91] Fountain, above n. 1, 1759.
[92] Ibid, 1759.
[93] Heim, B E 'Exploring the Last Frontiers for Mineral Resources: A Comparison of International Law Regarding the Deep Seabed, Outer Space. and Antarctica' (1990) 23 *Vanderbilt Journal of Transnational Law* 819, 827-28.
[94] See generally Reynolds, G H, 'International Space Law: Into the Twenty-First Century' (1992) 25 *Vanderbilt Journal of Transnational Law* 225; Risley, L L, 'An Examination of the Need to Amend Space Law to Protect the Private Explorer in Outer Space' (1998-1999) 26 *Western State University Law Review* 47; Jiru, J A 'Star Wars and Space Malls: When the Paint Chips off a Treaty's Golden Handcuffs' (2000) 42 *South Texas Law Review* 155; Dunietz, J, 'Floating Treasure: Space Law Needs to Catch Up with Asteroid Mining' (28 August 2017) *Scientific American* <https://www.scientificamerican.com/article/floating-treasure-space-law-needs-to-catch-up-with-asteroid-mining/> (date accessed: 25 October 2017).

the limits of the regime.[95] including the establishment of a profit-sharing system. Given the experience of the *Moon Agreement* discussed below, this is likely to be difficult, time-consuming, and not guaranteed of success. The negotiation of such a regime may, however, have positive follow-on effects as rules for environmental protection, debris mitigation and safety may be established with trade-linked consequences.

(c) IS OUTER SPACE THE 'COMMON HERITAGE OF MANKIND'?

As described in an earlier chapter, the *Moon Agreement* is considered to have failed; the 'common heritage of mankind' doctrine does not carry the force of law from that source. Can it be said, however, to have obtained force as an interpretation of 'province of mankind'? Sources are sharply divided on both the equivalence of the terms, and the degree to which any equivalence is accepted.

Most sources promoting the equivalence of the terms do so with little to no explanation; the authors proceeding to other questions of law on the assumption that 'common heritage of mankind' has displaced or redefined 'province of mankind'. For example, Fountain's otherwise detailed and methodical article 'Creating Momentum in Space: Ending the Paralysis Produced by the Common Heritage of Mankind Doctrine' proceeds on the basis that Article I, when read in the context of the preamble's 'peaceful purposes' and Article II's ban on national appropriation, constitutes an expression of the 'common heritage of mankind' doctrine.[96] This assumption ignores the three other elements of 'common heritage of mankind' as expressed elsewhere in her article, as well as the fundamental distinction between the freedom to act inherent in 'province of mankind' and the authorisation regime envisaged by 'common heritage of mankind'.[97] Fountain fails to connect these aspects of the doctrine to the language of the *Outer Space Treaty*, interpretations put forward by the States Parties, or subsequent State practice.

Hobe and Chen commit a similar oversight in a chapter of the *Routledge Handbook of Space Law*. In discussing the 'province of mankind', the authors define and give the history of the

[95] Von der Dunk, 'International Space Law', above n. 19, 58.
[96] Fountain, above n. 1, 1762.
[97] Von der Dunk, 'International Space Law', above n. 19, 57-58.

'common heritage of mankind' doctrine, implying their equivalence, without additional commentary.[98] Rana asserts that 'the *Outer Space Treaty* of 1967 also expresses the common heritage of mankind intent, though in different terms'[99] because 'reasonably read', the 'common heritage of mankind' language used by the *Moon Agreement* 'conveys a meaning similar to the province of all mankind language' used in the *Outer Space Treaty*.[100] These authors do not provide evidence of this view being held by the States Parties; a critical enquiry for the purposes of establishing that this interpretation constitutes subsequent State practice.

The views of States Parties on the question are available in the *travaux préparatoires* to the *Moon Agreement*. The views of the representative for Argentina reflect many of the statements made by the developing and non-spacefaring nations around 1978.[101] These countries hoped that 'progress could be achieved on the basis of the principle, *endorsed by the great majority of countries*, that the Moon and its natural resources constituted the common heritage of mankind.'[102] Equally, though, these countries did not put forward 'common heritage of mankind' as an established interpretation of Article I paragraph 1 *Outer Space Treaty*, but rather a new principle, elaborated during the negotiations to the *United Nations Convention of the Law of the Sea*, to be included in a future treaty that '*would* ensure that all countries, and in particular the developing countries, *would* have an equitable share in any benefits resulting from activities carries out under the treaty, including the exploitation of the Moon's resources' (emphasis added).[103]

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[98] Hobe and Chen, above n. 31, 33.

[99] Rana, above n. 56, 226.

[100] Ibid 227.

[101] See for example the views of Brazil, Chile, Ecuador, Indonesia, Sweden and Turkey: *LSC Summary Records*, UN GAOR, 2nd comm, 17th sess, 288th mtg, UN doc A/AC.105/C.2/SR.288 (20 March 1978); *LSC Summary Records*, UN GAOR 2nd comm, 17th sess, 289th mtg, UN doc A/AC.105/C.2/SR.289 (21 March 1978).

[102] *LSC Summary Records*, UN GAOR, 2nd comm, 17th sess, 291st mtg, UN doc A/AC.105/C.2/SR.291 (22 March 1978) [11] (Argentina).

[103] *LSC Summary Records*, UN GAOR, 2nd comm, 17th sess, 291st mtg, UN doc A/AC.105/C.2/SR.291 (22 March 1978) [11] (Argentina).

The representative for Indonesia describes the tensions between the more numerous developing/non-space faring countries and the space powers that defined the negotiations. While 'considerable progress had unquestionably been made' as a result of 'concerted efforts', 'difficulties persisted on the legal status of the Moon and its natural resources' because of the 'understandable' concern of 'certain nations' who are already 'in a position to harness' the resources of the Moon. The representative for Indonesia stressed that the considerations inherent in the 'common heritage of mankind' doctrine '*should* be adequately reflected in the future treaty on the Moon, *so as to* facilitate the common use by all States of the resources of outer space' (emphasis added).[104] Like the representative for Argentina, this use of the future tense to describe the implementation of the 'common heritage of mankind' doctrine evidences a desire for future agreement; not an expression of belief in the current state of law. This state of disagreement is reflected in the spacefaring nations' lack of interest in further defining the status of the Moon and celestial bodies.[105] The German representative did not see the point in further definition,[106] the Australian representative thought the question should be deprioritised in light of other more urgent considerations.[107] The comments of the representative for Belgium recall the Soviet dismissal of the *Outer Space Treaty* language as lacking substance, warning against semantic discussions.[108]

Although it entered into force, the *Moon Agreement* is considered to have failed. The *travaux préparatoires* clearly indicate that while many countries favoured the inclusion of the term during negotiations, it did not ultimately translate to adoption of the treaty. The record of negotiations from 1978 does not indicate that there was widespread agreement among States Parties to the *Outer Space Treaty* that 'province of mankind' in that original treaty should be understood to mean 'common heritage of mankind'. It seems clear from the views of the States

[104] *LSC Summary Records*, UN GAOR, 2nd comm, 17thth sess, 288th mtg, UN doc A/AC.105/C.2/SR.288 (20 March 1978) [25] (Indonesia).
[105] Bueckling, above n. 58, 20.
[106] *LSC Summary Records*, UN GAOR 2nd comm, 17th sess, 289th mtg, UN doc A/AC.105/C.2/SR.289 (21 March 1978) [31]-[37] (Germany).
[107] *LSC Summary Records*, UN GAOR 2nd comm, 17th sess, 289th mtg, UN doc A/AC.105/C.2/SR.289 (21 March 1978) [38]-[42] (Australia).
[108] *LSC Summary Records*, UN GAOR 2nd comm, 17th sess, 289th mtg, UN doc A/AC.105/C.2/SR.289 (21 March 1978) [43]-[46] (Belgium).

in favour of its inclusion that the 'common heritage of mankind' language was intended to supplement the existing regulation of the legal status of celestial bodies in the *Outer Space Treaty*, not to refine it. It was an entirely new concept, born out of the *Convention of the Law of the Sea* negotiations. Indeed, both concepts are included in the body of the *Moon Agreement* -- 'province of mankind' is retained in Article IV, while 'common heritage of mankind' is defined in Article XI. The failure of the developing States to redefine the 'province of mankind' to 'common heritage of mankind' in accordance with their interests has been consistently affirmed by its exclusion from subsequent UN declarations and COPUOS reports.[109]

2 GLOBAL COMMONS

It is argued by most scholars reviewed for this paper that if *Outer Space Treaty* Article I has any substantive meaning, it is that space and celestial bodies are a 'global commons'. That would mean that, in the same manner as fishing in the high seas, the exploitation of resources outer space is permitted to all States who has the capacity to access them, with no obligation to share those resources with others. This does not mean that the freedom of activities contained in Article I is unfettered; rather that any limits to such freedom would have to be imposed by general international consensus, typically by international treaties with global application, or by customary international law.[110] The *Outer Space Treaty* itself already imposes some limitations on the Article I freedom; for example by requiring space activities to be conducted in accordance with international law[111] and by requiring States to allow access to any space stations and installations by any other State on the basis of reciprocity.[112] In the absence of a global regime regulating the exploitation of resources, celestial bodies are 'fair game' for commercial exploitation and extraction.

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[109] See for example *Declaration On International Cooperation In The Exploration And Use Of Outer Space For The Benefit And In The Interest Of All* State*s, Taking Into Particular Account The Needs Of Developing Countries* GA Res 51/122, UN GAOR, 51st sess, UN doc A/RES/51/122 (4 February 1997) Preamble and paragraph 1.

[110] Von der Dunk, 'International Space Law' above n. 19, 58-59.

[111] *Outer Space Treaty* art III.

[112] *Outer Space Treaty* art XII.

Fountain points out that a problem inherent with the application of this doctrine to outer space is the 'tragedy of the commons'.[113] Each State with spacefaring capacity can enjoy the benefit of exploiting the resources to their maximum, while the cost of that increased use is spread out over all countries.[114] This risks being particularly unequitable in the context of space, where the financial and technological barrier for entry to exploitation activities is high. Developing countries may theoretically be deprived of the future benefit of space resources if resources are extracted and profits hoarded before they have a chance to develop a competitive space industry of their own.

Such a policy, if unchecked by global agreement to regulation, might undermine the object and purpose of the *Outer Space Treaty*. A race to exploit the maximum resources of celestial bodies within current reach of human technology is unlikely, in my view, to advance the notions of international cooperation and the development of friendly relations between nations contained in the preamble. Most importantly, it is antithetical to the notion contained in Article I and the preamble that the use of outer space should be carried out for the benefit of all peoples, 'irrespective of the degree of their economic or scientific development'. As Hardin observes, 'ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons.'[115]

Von der Dunk does not share this pessimism. He posits that the broadness of the concepts of State responsibility and liability should provide some guarantees that the tragedy of the commons could be avoided in outer space.[116] He further speculates that the references to international law, international cooperation and the interests of all countries described above

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[113] See Bosselman, F, 'Replaying the Tragedy of the Commons (book review)' (1996) 13 *Yale Journal on Regulation* 391, citing Hardin, G, 'The Tragedy of the Commons' (1968) 162 *Science* 1243. Bosselman says 'The scenario, as described by Hardin, is that of the pasture open to all where herdsmen can freely graze their cattle. For a time, this arrangement may work as long as the number of grazing cattle does not exceed the resources of the pasture. Inevitably though, the herdsmen will want to add cattle to their herds to maximize profit. This, in turn, will lead to overgrazing and the inevitable destruction of the resource.'

[114] Fountain, above n. 1, 1759.

[115] Bosselman, above n. 113, 391-392.

[116] Von der Dunk, 'International Space Law' above n. 19, 56

could 'serve as a check (or at least the possibility of creating such checks) on unfettered unilateral usage of outer space to the detriment of all others.'[117] This optimism is based on von der Dunk's implied belief that an international regime might be established to regulate resource exploitation to curb excesses, in the manner of the *Convention of the Law of the Sea* or the *Antarctic Treaty System*.[118] While this avenue is certainly available, the experience of the *Moon Agreement* warns that such an ambitious project is fraught with political danger.

The likelihood of reaching such an agreement is undermined by the expressed position of the United States. The United States emphatically rejects the notion that outer space constitutes global commons. In a December 2017 speech, Dr Scott Pace of the National Space Council said

> outer space is not a 'global commons', not the 'common heritage of mankind', not '*res communis*', nor is it a public good. These concepts are not part of the *Outer Space Treaty*, and the United States has consistently taken the position that these ideas do not describe the legal status of outer space. … [R]eference to these concepts is more distracting than it is helpful. To unlock the promise of space, to expand the economic sphere of human activity beyond the Earth, requires that we not constrain ourselves with legal constructs that do not apply to space.[119]

These views were also expressed by the United States in the most recent report of the legal subcommittee of COPUOS.[120] As a major space power, such emphatic rejection of the concept of global commons does not bode well for the regulation that would be necessary to preserve it.

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[117] Ibid, 57.

[118] *Antarctic Treaty*, opened for signature 1 December 1959, 402 UNTS 71 (entered into force 23 June 1961).

[119] Pace, S, 'Space Development, Law, and Values' (speech delivered at IISL Galloway Space Law Symposium,
Washington, D.C., 13 December 2017).

[120] *Report of the Legal Subcommittee on its fifty-sixth session, held in Vienna from 27 March to 7 April 2017*, Committee on the Peaceful Uses of Outer Space, UN GAOR 60th sess, UN Doc A/AC.105/1122 (18 April 2017) [227].

C CONCLUSION

The 'frenetic environment' in which the *Outer Space Treaty* and *Moon Treaty* was negotiated has given rise to 'volumes of competing definitions, arguments, and positions regarding the legal ramifications of the mankind provisions'.[121] Article I contains a transformational idea, that is 'pregnant with possibility'[122] – but limited in substance. I conclude that the provision itself carries insufficient substantive meaning to bear real force. The 'province of mankind' is empty rhetoric, designed to paint over the irreconcilable interests of free-market spacefaring nations and developing nations seeking to redress centuries of resource inequality through socialistic policy. 'In the benefits and interests of all countries' is less poetic, yet equally vague – it is meaningless in the absence of a mechanism for allocating and valuing property rights. The 'common heritage of mankind' is a new concept to international law; any attempt to read it back into the *Outer Space Treaty* is in error. If widespread agreement on the concept had been established during negotiations for the *Moon Agreement*, there may have been strong grounds to consider it a clarification of Article I *Outer Space Treaty*. This is, however, simply not the case.

Whether outer space is a 'global commons' is not so clear. While academic sources certainly agree that they consider it so; the States Parties have given very little indication of acceptance of this interpretation – either explicitly, or implicitly by pushing to establish a regulatory regime to preserve the commons. The conclusion for now, then, is in the negative.

So what does all of this mean for the space settlement? In short, it means that any profit derived from the venture is not confiscated and redistributed to non-participating countries. It means that participants in private operations may have some confidence that they are entitled, in the ordinary course, to the benefit of any return generated on their investment.

[121] Rana, above n. 56, 225.

[122] Rana, above n. 56, 225.

IV DOES THE ART II BAN ON APPROPRIATION CONSTRAIN THE ART I FREEDOM?

A INTRODUCTION

Article II *Outer Space Treaty* provides that 'outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.'[123] This provision is the subject of much scrutiny and debate. On its face, the provision means that a State may not annexe, colonise or otherwise acquire a celestial body under the general rules of international law; a planet is not an island.[124] This is a rejection of customary international law that applied before the entrance into force of the *Outer Space Treaty*, which held that the traditional conditions of acquisition of new territory applied on celestial bodies.[125] In this section I consider whether that the ban on appropriation is inconsistent with the establishment of a settlement on Mars, and to what extent domestic jurisdiction might be exercised in the settlement. I consider whether the ban extends to private appropriation, and if space resources are objects of the ban.

B 'APPROPRIATION'

Appropriation typically refers to the permanent taking of property for one's exclusive use or the exercise of exclusive control or use on a permanent basis. It follows that the building of structures on the surface of Mars may bring the State into conflict with this provision. This question has not been widely addressed in the scholarly works reviewed for this paper.[126]

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[123] *Outer Space Treaty* art II.

[124] For a demonstration of how the law of outer space might be revised to more closely resemble UNCLOS, thus treating planets more like islands, see Thomas, J C, 'Spartialis Liberum' (2005) 7(3) *Florida Coastal Law Review,* 579; Fountain, above n. 1, 1762.

[125] Smirnoff, M, 'The Legal Status of Celestial Bodies' [385] (1961) 28 *Journal of Air Law and Commerce*, 385; Jacobini, H B, 'Effective Control as Related to the Extension of Sovereignty in Space' (1959) *Journal of Public Law* (Spring) 97; Cheng, above n. 44, 229.

[126] Gorove, S, 'Interpreting Article II of the Outer Space Treaty' (1969) 37(3) *Fordham Law Review* 349 does briefly consider the question. However, as discussed in a subsequent section, Gorove holds a fairly radical view as to the right of private operators to appropriate space, as long as it is not carried out under sovereign power. His views, therefore, do not assist to determine the general proposition.

Article XII refers to 'stations' and 'installations' to which States Parties control access.[127] Article VIII *Outer Space Treaty* also explicitly provides that 'ownership of objects … landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space.'[128] If a settlement is composed entirely of objects landed or constructed on the surface of Mars, ownership rights over those objects is retained. In my view, this indicates that it is not the exclusivity of these installations that is to be avoided, but permanence. The notion of a Mars settlement implies a degree of permanence; whether this can be reconciled with the ban on appropriation of land requires careful consideration of the intentions of the drafters with respect to the use of the term.

During negotiations for the *Outer Space Treaty*, some parties indicated that the rationale behind the non-appropriation principle was to avoid 'a new type of colonialism on an interplanetary scale'.[129] Article II was hoped to 'prevent the rivalries that had poisoned relations between States during the age of earthly discoveries'[130] and prevent the repetition of the 'history of colonial regimes arbitrarily established in newly discovered territories.'[131] The analogy of colonialism, Columbus' first voyage across the Atlantic and the 'discovery' of the New World[132] is rhetorically compelling, but, in my view, should be treated with caution. Mars is not inhabited by an existing human population who would be displaced or otherwise affected by settlement.[133] While it cannot be said that Mars is *terra nullius* (because it belongs, in whatever fashion, to 'mankind')[134], the risk of the repetition of the colonial experience does not necessarily follow. The representative for the then-USSR summed up this view saying that

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[127] Exclusivity considered further in Chapter V.

[128] *Outer Space Treaty* art VIII.

[129] *FCGA Verbatim Records*, UN GAOR, 1st comm, 21st sess, 1492nd mtg, UN doc A/C.1/SR.1492 (17 December 1966), 462 (Chile).

[130] *FCGA Verbatim Records*, UN GAOR, 1st comm, 21st sess, 1492nd mtg, UN doc A/C.1/SR.1492 (17 December 1966), 462 (Brazil).

[131] *LSC Summary Records*, UN GAOR, 2nd comm, 5th sess, 62nd mtg, UN doc A/AC.105/C.2/SR.62 (19 July 1966) 9 (Mongolia).

[132] *GA Verbatim Records*, UN GAOR, 1st comm, 21st sess, 1499th mtg, A/PV.1499 (Prov.) (19 December 1966) 12 (Italy).

[133] The question of whether Mars and other celestial bodies might be home to non-human life, to which personhood might be due, is outside the scope of this paper.

[134] See Chapter II of this paper.

> A treaty could deal with only the problems arising at the current stage of human evolution … future development would give rise to new problems requiring subsequent solution. But it would be unwise to look too far ahead and to attempt to prescribe rules for situations on which it was impossible to form adequate judgment at the present moment.[135]

In the short term, settlement infrastructure may be designed with portability in mind in order to observe the letter of the law. In the longer term, however, as the settled population grows, installations that are more permanently integrated with the landscape may become critical to the comfort and prosperity of the settlement. Ultimately, it will be the response of States Parties[136] to the gradual entrenchment of the installations that will determine to what extent these activities constitute an unacceptable 'appropriation'.

C JURISDICTION

The concept of non-appropriation in Article II also has the effect of complementing Article VIII *Outer Space Treaty* on the question of the reach of domestic jurisdiction. Cheng asserts that Article II means that as among the contracting States, none will be entitled to exercise *territorial jurisdiction*, no matter on what basis, over any part of outer space or celestial bodies.[137] This view is echoed by many scholars including Sharpe, Tronchetti and von der Dunk.[138] As with the high seas, however, the exclusion of territorial jurisdiction does not undermine the presence of other forms of jurisdiction. Article VIII provides that a State Party shall 'retain jurisdiction and control over [objects registered to them], and over any personnel thereof, while in outer space or on a celestial body.'[139] This combination of quasi-territorial

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[135] *LSC Summary Records*, UN GAOR, 1st comm, 5th sess, 63rd mtg, UN doc A/AC.105/C.2/SR.63 (16 July 1966) 10 (Union of Soviet Socialist Republics).

[136] Both in terms of *Vienna Convention on the Law of Treaties* Article 31(3)(b) and in terms of development of customary international law.

[137] Cheng, above n. 44, 230.

[138] Tronchetti, F and Sharpe, C, 'Legal Aspects Of Public Manned Spaceflight And Space Operations' in F Von der Dunk and Tronchetti, F (ed), *Handbook of Space Law* (Edward Elgar Publishing Limited, 2015) 618, 633; Von der Dunk, 'International Space Law' above n. 19, 69, 77.

[139] *Outer Space Treaty* art VIII.

and personal jurisdiction is sufficient, in the absence of territorial jurisdiction, for domestic law to be applied within the confines of a human settlement.

D NON-NATIONAL APPROPRIATION

The inclusion of the modifier 'national' to describe the kind of appropriation that is banned has generated claims that it provides a 'loophole' allowing *private* appropriation of celestial bodies.[140] Gorove is the key proponent of this theory.[141] Gorove's interpretation is a textual one: the *Outer Space Treaty* in its current form distinguishes the prohibited form of appropriation ('national') from other forms of appropriation, such as private appropriation. Thus, in his view, 'an individual … or a private association or an international organization could lawfully appropriate any part of outer space, including the Moon and other celestial bodies.[142]

The debate to which these claims have given rise is heated, but in my view easily settled by reading Article II in the context of Article VI.[143] Article VI provides that

> States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities… The activities of non-governmental entities … shall require authorisation and continuing supervision by the appropriate State Party to the Treaty.[144]

Tronchetti asserts that in the context of Article VI, 'national' also includes private activities.[145] It follows that if a State is prohibited from engaging in certain conduct, then it 'lacks the authority to licence its nationals or other entities subject to its jurisdiction to engage in that

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[140] See generally Pop, V, Appropriation In Outer Space: The Relationship Between Land And Ownership And Sovereignty On The Celestial Bodies, 16 *Space Policy* (2000) 275; Gorove, above n. 126, 42; O'Donnell, R H, 'Staking a Claim in the Twenty-First Century: Real Property Rights on Extra-Terrestrial Bodies Comment' [461] (2006) 32 *University of Dayton Law Review* 461.

[141] Gorove, above n. 126.

[142] Gorove, above n. 126, 42.

[143] *Vienna Convention on the Law of Treaties* art 31(1).

[144] *Outer Space Treaty,* art VI.

[145] Tronchetti, 'Legal aspects of space resource utilisation' above n. 37, 780.

prohibited activity.'[146] Individuals can benefit from the freedoms of outer space and only insofar as States empower them to do so through national space legislation.[147] This interpretation reflects the views of the International Institute of Space Law Board of Directors, expressed in a rare statement in 2004:

> Article II prohibition on national appropriation extends to private actors because pursuant to Article VI, the activities of non-governmental entities (private parties) are national activities.[148]

Additionally, to grant some advantage to private operators over national and internationally-cooperative operators in outer space would go against the 'spirit and idea' behind the *Outer Space Treaty* and space law generally – being the promotion of international cooperation.[149]

E APPROPRIATION OF RESOURCES

More recently, debate has been generated by the proposition that space resources are also the object of this ban, accordingly whether it operates as a ban on the extraction of these resources as otherwise permitted by the freedom of activities contained in under Article I.[150] This is an important question for the purposes of a human settlement on Mars, because current models of space settlement rely on the use of resources such as water and minerals for subsistence and construction. The USA has unilaterally expressed the view that space resources are not subject to the Article II prohibition. In 2015 it passed the *Spurring Private*

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[146] Sterns, P M and Tennen, L I, 'Privateering and Profiteering on the Moons and Other Celestial Bodies: Debunking the Myth of Property Rights in Space' (2003) *Proceedings of the 45th Colloquium on the Law of Outer Space* 59; Sterns, P M, Stine, G H and Tennen, L I, 'Preliminary Jurisprudential Observations Concerning Property Rights On The Moon And Other Celestial Bodies In The Commercial Space Age' (1996) *Proceedings of the 39th Colloqium on the Law of Outer Space* 50, 53.

[147] Hobe and Chen, above n. 31, 30-31.

[148] Board of Directors of the International Institute of Space Law, 'Statement by the Board of Directors Of the International Institute of Space Law (IISL) On Claims to Property Rights Regarding The Moon and Other Celestial Bodies' (2004).

[149] Jenks, C W, Space Law (Frederick A. Praeger, 1 ed, 1965) 201.

[150] See Fountain above n. 1 1762; see generally Tronchetti, 'Legal aspects of space resource utilisation' above n. 37; Myers above n 37.

Aerospace Competitiveness and Entrepreneurship Act of 2015[151] which guarantees private actors rights in an 'asteroid resource or space resource obtained, including the right to possess, own, transport, use and sell the asteroid resource or space resource.'[152]

The 2017 report of the legal subcommittee of COPUOS indicates that this does not reflect the widespread understanding of the States Parties. Some States 'expressed concern' in that forum that the national legislation unilaterally enacted to protect private property rights in resources 'may amount to either a claim of sovereignty or a national appropriation of those bodies' and thus could constitute a violation of Article II *Outer Space Treaty*.[153] The committee has called for further research and negotiations to reach a satisfactory outcome.

F CONCLUSION

The *Outer Space Treaty* presents a conflicting image of how celestial bodies may be used. On the one hand, it expressly anticipates the presence of 'stations' and 'installations' on the surface of a planet; and yet Article II seems expressly to prevent States from exercising some ordinary rights of ownership over the area in which those structures are placed. In my view, these are reconciled by taking a narrow view of Article II. At its core, it is intended to prevent States Parties from claiming territory in space; in particular to prevent powerful and resource-rich countries from planting their flag and excluding all comers from the exploration, investigation and use of prime space. It does not seem intended to completely exclude the possibility of permanent structures on or below the surface of planets – this possibility does not appear in the *travaux preparatoires* to have been considered. Article II is aimed at the fair distribution of power and control among States exercising their Article I rights. I conclude, then, that if the natural progress of a human settlement on Mars requires the building of more permanent structures, and long-term activities such as agriculture, this is permissible under the terms of Article II. These structures and activities may not, it is certain, be used as evidence

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[151] *Spurring Private Aerospace Competitiveness and Entrepreneurship Act of 2015,* Pub L 114-90, ss 52302-51303.

[152] *Spurring Private Aerospace Competitiveness and Entrepreneurship Act of 2015,* Pub L 114-90, ss 52302-51303.

[153] *Report of the Legal Subcommittee on its fifty-sixth session, held in Vienna from 27 March to 7 April 2017*, Committee on the Peaceful Uses of Outer Space, UN GAOR 60th sess, UN Doc A/AC.105/1122 (18 April 2017) [74]-[76].

of territorial acquisition by the supervising State. This will become relevant in circumstances where a rival intends to establish a second settlement in proximity to the first. The first settlement has no grounds upon which to deny the rival access to that space.

V CAN THE SETTLEMENT EXCLUDE OUTSIDERS?

A INTRODUCTION

If it is accepted that a private actor might establish and maintain a human settlement on Mars, a subsequent logical question is to what extent that actor is entitled to exercise the rights of ownership over that settlement. The bundle of ownership rights includes possession, control, exclusion, enjoyment and disposition. While it was established in Chapter IV that by operation of Article II *Outer Space Treaty* a State may not own territory in outer space, Article VIII explicitly permits 'ownership of objects … landed or constructed on a celestial body, and of their component parts.'[154]

In this chapter, I narrow in on the right of exclusion. Assuming that the human settlement is established, to what extent might that settlement exclude other people and States from access and use of its facilities? Specifically, to what extent might a settlement be obliged to permit uninvited outsiders, such as from a rival company or State, to take up unauthorised residence in the settlement? As a general principle, Article I *Outer Space Treaty* provides that there 'shall be free access to all areas of celestial bodies'.[155] However, this is constrained by Article VIII that permits States to retain ownership, and accordingly the right of exclusion, over their stations and installations. Where such stations or installations are on the surface of a celestial body, these sections appear to be in conflict.

B ARTICLE XII SITE VISITS

The *Outer Space Treaty* explicitly anticipates two instances where States are required grant access to their stations or installations by other States or persons. The first is for planned site visits by State representatives. Article XII provides that

> [a]ll stations [and] installations … on … celestial bodies shall be open to representatives to other States Parties to the Treaty on a basis of reciprocity. Such representatives shall give reasonable advance notice of a projected visit, in order that appropriate

[154] *Outer Space Treaty* art VIII.

[155] *Outer Space Treaty* art I.

> consultations may be held and that maximum precautions may be taken to assure safety and to avoid interference with normal operations in the facility to be visited.[156]

The term 'visit', the requirement of 'advance notice' and juxtaposition of 'normal operations' clearly imply that the kind of access required under this section is short-term and non-integrative. In my view, Article XII read in conjunction with Article VIII (ownership of objects) operates as an accepted constraint on the Article I freedom of access.

C ARTICLE V RENDERING ASSISTANCE TO ASTRONAUTS

The second provision rendering the grant of access necessary is the requirement to 'render assistance' to an 'astronaut'. Article V provides that

> States Parties to the Treaty shall *regard astronauts as envoys of mankind* … In carrying on activities in outer space and on celestial bodies, the *astronauts of one State Party shall render all possible assistance to the astronauts* of other States Parties.[157] (emphasis added)

The obligation to 'render all possible assistance' is clear. Both the subject and the object of the Article V *Outer Space Treaty* obligation is the 'astronaut'. Who counts as an 'astronaut'? The language of the *Rescue Agreement*, muddies, rather than clarifies, these waters. Although it uses the term 'astronaut' in the title twice,[158] the body of the agreement refers exclusively to 'personnel of a spacecraft'.[159] This leaves the status of many potential actors in outer space, such as the inhabitants of a Mars settlement and the non-crew passengers on a spacecraft undefined.

Some progress on this issue has been made since the first space tourism flights. Seven 'space tourists' have flown to space to date; all flew on Russian spacecraft operated by the Russian

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[156] *Outer Space Treaty* art XII.

[157] *Outer Space Treaty* art V.

[158] Long title: *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*.

[159] *Rescue Agreement* art I-IV.

Space Agency and all have visited the Russian module of the International Space Station.[160] Concern from other International Space Station participant States as to the status of the first space tourist, Dennis Tito in 2001, led to an agreement between the partner States on a classification of 'spaceflight participants' who are 'individuals… sponsored by one or more partner(s)' and include 'engineers, scientists, teachers, journalists, filmmakers or tourists' as distinct from 'professional astronauts'.[161] Von der Dunk observes that while this distinction currently only applies in the International Space Station context, the fact that the International Space Station comprises most of the current major space powers (excluding only China and India) means that their legal arrangements 'stand a good chance of ultimately being a point of departure for developing relevant international law ultimately applicable to the whole world'.[162]

It follows from this position that *Outer Space Treaty* Article V does not apply to any person not classified as a professional astronaut, being all other participants in activities in outer space. Sundahl argues that if Article V does not directly apply to non-crew space activity participants, humanitarian considerations 'should be imperative and therefore result'[163] in the application of the Agreement to every human being in outer space.[164] Von der Dunk strongly refutes this position, arguing that existing general humanitarian obligations[165] to assist people in distress 'adequately cover what is necessary and justified for spaceflight'[166]. To extend Article V to all persons in outer space undermines the obvious specificity of the *Rescue Agreement* ('astronauts', not 'persons'). Von der Dunk analogises tourists in the 'high mountains or similar realms'; the inherent dangers of such activities are accepted willingly and only for pleasure (or,

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[160] See Wikipedia, 'Space Tourism' (17 February 2018) Wikipedia <https://en.wikipedia.org/wiki/Space_tourism> (date accessed: 18 February 2018).

[161] *Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers* (2001) s 3 <http://www.spaceref.com/news/viewsr.html?pid=4578> (date accessed 18 Feb 2018).

[162] Von der Dunk, F, 'Legal Aspects of Private Manned Spaceflight' in Von der Dunk, F and Tronchetti, F [eds] (2015) *Handbook of Space Law* 711.

[163] Ibid, 711.

[164] Sundahl, M J, 'The Duty to Rescue Space Tourists and Return Private Spacecraft' (2009) 35 *Journal of Space Law* 167, 178-189.

[165] Recalling that general international law applies in outer space: *Outer Space Treaty* art III.

[166] Von der Dunk, 'Legal Aspects Of Private Manned Spaceflight', above n. 162, 711-712.

I might add, any other personal goal such as notoriety or curiosity). No obligation exists to rescue or assist such persons at the risk of the rescuer's life or resources.[167]

I conclude that, for present purposes, the obligation to render assistance to 'astronauts' is a narrow one that likely excludes Mars settlers, and non-crew participants in private spaceflight. For that reason, Mars settlers are not obliged on the basis of Article V *Outer Space Treaty* to grant access to their settlement to other persons; in danger or otherwise.[168]

D CONCLUSION

I conclude that the *Outer Space Treaty* permits the settlement to exclude others from its 'installations' and 'stations'; but not from the general area in which such objects are placed. The right of exclusion is not absolute. The settlement must grant short-term access to 'state representatives' where adequate notice is given. Because settlers are not 'astronauts', they are not obliged to give other persons access to their facilities, even in circumstances where the other person requires assistance or may be in mortal peril. While the goal of international cooperation contained in the preamble may create a *moral* obligation on settlers to grant such assistance, it is not a legal one. In those circumstances, the question of duty to render aid or rescue is one of domestic law as applied to the settler by personal or quasi-territorial jurisdiction.

[167] Ibid, 711-712.

[168] This gives rise to the question of whether refugee law might apply to a Mars settlement; would settlers be obliged to accept refugees should they meet the requirements of the *Refugee Convention*?* This is an area for further research. **Convention Relating to the Status of Refugees*, opened for signature 28 July 1951, 189 UNTS 150 (entered into force 22 April 1954).

VI CONCLUSION

It's certainly not going to be a 'vacation jaunt'.[169] The practical obstacles to the establishment of a human settlement on Mars, and the human cost of such an endeavour, are difficult to imagine. What this paper has demonstrated is that the legal obstacles are, in some ways, just as fraught and unknowable as the journey itself.

These are many legal aspects of space settlement that I have *not* addressed in this paper, and yet will be critical to the success of the venture. What of private operators who eschew the international legal regime entirely, and launch from a 'flag of convenience' State – can they claim to 'own' a planet, or an asteroid? Is 'terraforming' the environment for to comfort of settlers an act of appropriation? What about the conduct of space vehicles – if there are no roads or flight paths 'owned' by States, who controls traffic? Are settlers entitled to defend their right to exclude invaders by the use of weapons? What if those 'invaders' are in fact seeking asylum from persecution aboard a spacecraft?

These questions, while fascinating, are premature, perhaps even by a century or more. As I demonstrated in this paper, the core legal principles discussed here have not yet translated to actionable rules of ownership and business conduct. The rules will not remain static even in the absence of much-needed formal agreement between the States Parties as to their meaning. The first States and companies to conduct asteroid mining activities will establish precedents for how, if at all, financial benefits will trickle down to non-participant States. The first States and companies to establish an installation on the surface of a celestial body will set a precedent for how protective it might be of that space; how actively it discourages newcomers from breaching its perimeters. It will be the reaction of the global community to those decisions, and not the language of the *Outer Space Treaty*, that will determine rules that govern the next life phase of our 'interplanetary species'.

[169] Andersen, above n. 3.

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