Only a paper moon

The Artemis Accords and future human settlements

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1. Introduction

The Apollo programme that saw humans land on the Moon was the culmination of an intense effort and vast expenditure by the United States. Despite the expenditure, the nature of the technology meant that any presence on the lunar surface would be temporary and not sustainable over the longer term (see Chaikin 1998). The remaining decades of the twentieth century were spent consolidating space activity in Earth orbit (Amos 2010). By the start of the twenty-first century, however, countries once again started to look again at the Moon. China, India, and the European Space Agency all promulgated plans for sustained lunar exploration (e.g. ESA 2016). It was, however, the US' announcement of Project Artemis which drew questions of lunar activity back into contemplation by the international community (Pearlman 2019). Project Artemis was announced in 2017. It plans to send women and men back to the Moon. Through this project, the United States is seeking to create an enduring and sustainable presence on the Moon in partnership between NASA, the private sector, and international collaborators (Berger 2019).

Any lunar settlement inevitably begs questions about the overarching legal frame- work, especially in the contentious area of resource extraction and utilization (Larsen 2021). The result of the dramatic change in the lunar exploration policy of the United States was an equally dramatic diplomatic initiative known as the Artemis Accords (NASA 2020a). The Accords, whilst not international treaties, are agreements negotiated between NASA and those international partners who seek to be involved in the Artemis programme. The announcement of the Artemis Accords at the virtual 71st International Astronautical Congress was the result of a concerted diplomatic effort (NASA 2020b). Indeed, they have now been signed by 15 Partner States (Si-soo 2022). As such, the Accords are seeking to codify the way in which a sustained presence on the Moon would comport within established international agreements.

As international space law has developed, there has been discussion as to how settlements on other celestial bodies might be governed and what the role of law might be when humans establish a permanent presence on another planet (see e.g. Froehlich 2021). Foundational principles for regulating the activities of states in outer space were laid down in the Outer Space Treaty 1967. But the Treaty contains no real detail of how humans might establish a society in space beyond a prohibition on State appropriation of outer space and celestial bodies (Article II), forbidding military bases (Article IV), and making states internationally responsible for their national space activities, including non-governmental entities (Article VI). The Moon Agreement of 1979 attempted to codify provisions relating to exploration and the management of resources, but this was largely repudiated by the international community, including China, Russia, and the United States (Newman 2015, 32).

There has been considerable academic discussion of the way in which the Accords interact with the existing international law (see e.g. Johnson 2020; Wright Nelson 2020a; Deplano 2021). This discussion will touch upon that, whilst seeking to address the broader question about the evolution of space law. The question of the significance of the Accords will be addressed giving consideration as to the role that the Accords could have in shaping the way in which future human settlements might be governed beyond the terms of existing space treaties. Robinson (2004) identified that there was a key problem when considering any form of off-world governance: the lack of an underpinning shared value system upon which to base any subsequent regulatory or governance structure. As much as the Accords may represent a new epoch in space law, it is timely to ask whether they are another step towards identifying areas of commonality around which new space settlements can coalesce.

2. Lunar Governance and the Artemis Accords

The Accords themselves capture the core principles on which the partner states who wish to engage in Project Artemis have agreed to adhere. It is tempting to point to a superficial similarity to the way in which governance of the International Space Station (ISS) was managed in the 1990s. The ISS, however, was a partnership. Project Artemis is directed and funded by NASA and the United States. As von der Dunk (2020) states, legal coverage of the ISS project was by means of 'a single all- encompassing international treaty'. The Accords are not intended to be binding in the way that international treaties bind but they do clearly represent the 'price of admission' to the Artemis programme (Newman 2020) as they are negotiated by the United States with the partners bilaterally. Those states that wish to enjoy the opportunities, and presumably the lucrative contracts afforded through involvement in Project Artemis, are obliged to adhere to the Accords with the danger of exclusion and loss of opportunities serving as the incentive for compliance.

If they are not binding international law, the question then arises about the nature and characteristics of the Accords within the realm of space governance (Taichman 2021). The preamble expressly affirms the compliance with existing space treaties and bilateral agreements. The Accords, therefore, are political agreements which highlight shared understanding of substantive matters of existing space law. Compliance with the international space treaties will be the responsibility of individual partner nations (Larsen 2021, 37), but the Accords also go on to develop and codify existing norms of behaviour. To that extent, they can be said to reflect certain core values of the current international governance regime. But the Accords also clearly have been prepared in anticipation of humans becoming permanent settlers in outer space, with the Moon the first stop on a journey to Mars (Johnson 2020a).

An examination of the principles contained within the body of the Accords shows a fascinating mixture of provisions that Deplano (2021, 801) has been identified as falling within three broad categories. The first are those provisions which restate existing international space law in the context of lunar exploration. These principles, such as registration requirements, the rescuing of astronauts, and the provision of assistance will undoubtedly form the bedrock of any future legal framework for settlements. The Accords are, however, silent on the troublesome question of liability and fault in space operations. Perhaps, as the Accords stress that Project Artemis will be conducted within the ambit of the existing space treaties, liability will fall within the purview of the Liability Convention.

The second category of provisions are those which take elements of existing international law and add an additional interpretation to the rights and obligations contained within the Treaties. These provisions cover such themes as resource extraction and the interrelated idea of deconfliction of activities as well as lunar heritage protection. Wright-Nelson (2020b, 2) identifies the controversial nature of the interpretations of these areas within the Accords. Given that resource extraction will be crucial for the survival of any extra-terrestrial settlement and the fabled 'trillion dollar space economy' is largely predicated on utilizing the vast mineral resources of the solar system, an examination of these criticisms will provide a crucial insight as to whether the Artemis Accords will provide a template for future settlements or whether they represent a dangerous distraction from the building of international consensus involving all members of the international community (Mosteshar 2020, 602–3).

The final categorization of principles identified by Deplano are those within the Accords that introduce concepts which are new to international law. It is worth noting that the principles contained within the Accords which fall into this this last category could be said to represent an identification of existing norms of behaviour rather than being entirely novel. The question of the legal status of historic lunar artefacts is one that has been the subject of significant discussion and lobbying.[1] Also, whilst not explicitly covered in the international space treaties, the management of space debris is something that the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) has discussed in some detail (Martinez 2021) and falls within the remit of the UN Guidelines for the Long-Term Sustainability of Outer Space Activities.

3. Compatibility of the Artemis Accords with Existing Space Law

The assertion that the Accords are compliant with extant international space law is crucial for their widespread international acceptance. From the perspective of embedding themselves as a normative instrument within the governance of human space activity, being able to trace their lineage back to the foundational space treaties endows the Accords with legitimacy. When considering the handful of instruments of international law that exist to govern space activity, the foundational document is the Outer Space Treaty of 1967, which sets out the basic principles of space law. It is very much the product of the Cold War of the 1950s and 1960s, when geopolitical tensions between the United States and the Soviet Union first began and the development of competing space technology occurred at a frantic pace (Gabrynowicz 2004).

The ideological tensions between the United States and the Soviet Union gave rise to obvious anxieties about one of those two superpowers gaining dominance in outer space (and, thereby, gaining a significant strategic military advantage). In this context, it was clear that any legal vacuum could lead to conflict and tension. States came to the realization that some form of international cooperation was required to ensure that human activity in outer space was conducted for peaceful purposes only. Thus, in UNCOPUOS was created. It was within the legal sub-committee of this forum that space law was negotiated, in the shadow of the race to the Moon, and always with one eye on security considerations (Blount 2010–2011)

The Outer Space Treaty was adopted by the General Assembly of the UN on 19 December 1966, opened for signature on 27 January 1967 in London, Moscow, and Washington, DC and came into force on 10 October 1967. At the time of writing 111 nations have ratified the Outer Space Treaty, with a further 23 having signed it. The widespread acceptance of the 1967 Treaty has provided a bedrock of certainty to the regulation of human space activity and the Treaty itself is rightly regarded as the centrepiece of international law relating to space activity (Lyall and Larsen 2020, 51). Any future human settlements will almost certainly take account of the provisions of the Treaty into their new legal framework.

Central to the idea of establishing a lunar base is the idea that states are free to use and explore outer space, the Moon, and other celestial bodies. Article I of the Outer Space Treaty sets out the general parameters of the lawful uses of outer space:

The exploration and use of outer space, including the Moon and other celestial bod- ies, shall be carried out for the benefit and in the interests of all countries ... and shall be the province of all mankind.

Article I goes on to provide that '[o]uter space, including the Moon and other celestial bodies, shall be free for exploration 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 celestial bodies'. It goes on to guarantee 'freedom of scientific investigation in outer space, including the Moon and other celestial bodies'.

As Hobe (2009, 27) identifies, having defined the use of outer space in relatively wide terms, the subsequent Treaty Articles then place specific limitations on the use of outer space by States Parties. All this fits directly onto the way in which the Accords are structured. The Accords do not mandate the uses of any Project Artemis installation, rather they amplify and codify the limitations on unfettered usage. At the heart of the Outer Space Treaty is the notion (articulated in the preamble) that the exploration and use of outer space should be for peaceful purposes. Section 3 of the Accords explicitly affirms that activities of Project Artemis will be exclusively for peaceful purposes.

Indeed, the Accords (at Section 3) follow Article III of the 1967 Treaty and embed the entire extant framework of international law within Project Artemis by stating that not only will the activities be conducted exclusively for peaceful purposes but also in accordance with relevant international law. This is a powerful provision as it tacitly acknowledges that the Outer Space Treaty has created new rules of international law (so-called *leges spaciales*) but that it also exists within the continuum of the relevant rules of international law which apply to international relations wherever they take place (Ribblelink 2009, 65).

The inclusion of peaceful purposes and the acknowledgement of wider responsibilities under international law was a welcome addition to the Accords, following the increasingly bellicose rhetoric coming from the

Trump administration during the later years of the 2010s (Smith 2017). Any future lunar settlement will present a tempting prospect for potential military expansion, especially given the creation of Space Forces. Within the Outer Space Treaty, Article IV provides inter alia that '[t]he establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be for- bidden', and so a distinct Space Force/military base is unlikely, although that does not discount some form of defensive or supporting presence (Raymond 2021).

Although 'peaceful purposes' permeates the 1967 Treaty, military activity and sup- port for terrestrially based military applications are now ubiquitous in Earth's orbital space. Despite persuasive academic arguments to the contrary, peaceful purposes is a term recognized by most space-active nations as meaning 'non-aggressive' (Jakhu, Chen, and Goswami 2020, 27). It seems unlikely that the United States will want to spend large amounts of money on lunar infrastructure without the means to protect these assets from the risk of attack from 'non-likeminded'[2] states. If the Accords are to provide a template for future space settlements, the acknowledgement of the international rule of law comes with the implicit recognition that peaceful purposes do not preclude a military presence. The possibility of conflict exists, not least when considering the provision of resources for establishing an off-world settlement.

4. The Utilization of Resources

The question of the legality of space mining and resource extraction is crucial to the establishment of a sustainable off-world settlement, be it on the Moon or beyond. To become self-sustaining, the settlements cannot simply rely on resources being brought from Earth. At the most basic level, settlers will need a breathable atmosphere, heating, water, and food. The Artemis Accords recognize the importance of the use of resources to survive and 'live off the land'. This is known as In-Situ Resource Utilisation (ISRU) and Section 10(1) of the Accords explicitly recognized that space resources benefit humankind by providing critical support for safe and sustainable operations.

When considering ISRU in a lunar context, Elvis, Milligan, and Krolikowski (2016) have shown that both water and sunlight are not distributed equally across the Moon, with pockets of resource-rich territory containing ice-water and the 'peaks of eternal light'—highland regions near the lunar poles that receive almost permanent sunlight.

These are ideal places to place habitats as sunlight can provide a near constant source of solar power and may become highly prized pieces of lunar real estate. The Accords themselves make no reference to fairness or a commitment to equitable distribution of ISRU-rich sites, which whilst understandable, is something that would be desirable as human settlements further into the solar system will have even less opportunity to rely on resources shipped from Earth. Concentration of ISRU-rich sites in the hands of one state, company, or other grouping with access to space is foreseeable. Equitable sharing of in situ resources should be expected and required as part of a responsible and sustainable settlement framework and may well come under the notion of 'corresponding interests' under Article IX of the Outer Space Treaty (Marchisio 2009, 176)

There is also the broader question of mining the Moon for possible precious metals and other such commercial considerations. With it comes a whole host of questions, such as the ability to control sites that are being mined in on a celestial body and the right to trade any minerals that might have been mined. Whilst the creation of the necessary infrastructure to enable widespread and efficient commercial mining of the Moon remains in the future, the question of the legality of commercial space mining is one that continues to vex the space law community and discussions continue in UNCOPUOS as to how to manage commercially motivated resource extraction in space.[3]

The ambiguity in whether it is lawful to extract resources from celestial bodies arises from Article II of the Outer Space Treaty 1967, a provision which seeks to restrict the ability of states to lay claim to the exclusive possession of any part of outer space:

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.

The competing arguments can be distilled into two fundamental interpretations of the position at international law. Some have taken Article II to be an explicit prohibition on state ownership and trading of lunar resources, advocating instead a multilateral, international legal order to administer and distribute (Hobe 2019, 158– 65). This is a position that several countries hold—that space resources and 'outer space' are indivisible aspects of each other, therefore appropriation of any sorts would violate international law.

The second position is that Article II is not relevant as no claim of ownership being made in respect of the territory. Instead, resource utilization is a usage of the celestial body under Article I of the 1967 Treaty. Furthermore, under Article VI of the Outer Space Treaty, State Parties to the Treaty are internationally responsible for the authorization and ongoing supervision of non-governmental entities (Cheney and Newman 2018, 266). It is this interpretation that is represented within the Accords. Article 10(2) provides an explicit statement that the signatories of the accords affirm that the mining of space resources is in accordance with international law. This follows on from the passing of the US Space Act 2015, which put the right to use and trade space resources into US domestic law, complete with an assertion that this is not a claim of sovereignty under international law (see Masson-Zwaan and Sundhal 2021).

The blanket acceptance of this second interpretation has been criticized by several academics. Delpano (2021, 807) states that whilst the signatories to the Accords affirm that resource extraction does not violate Article II, they provide no clarity or specificity as to how it does not violate the non-appropriation principle. Further- more, simply declaring that resource extraction is compliant with international law does not necessarily make it so. Accordingly, as the Accords are bilaterally negotiated between the United States and the partner states, they have the potential to undermine the whole Outer Space Treaty framework and the decision-making of UNCOPUOS (Mosteshar 2020, 602).

5. Deconfliction and 'Safety Zones'

It is not only the question of resource utilization where the compatibility with the existing international treaty regime has been questioned. Section 11 of the Accords provides for the avoidance of intentional activities that may cause harmful interference, a commitment to provide Artemis partners with necessary information regarding the location and nature of space-based activities under these Accords if they believe the activities might cause harmful interference or pose a safety risk. Perhaps most controversially, Section 11(7) of the Accords signals the intention to create 'safety zones'. These are 'buffer' areas, where activities that may cause harmful interference are likely to occur.

The idea is that by creating these zones, other users of the lunar environment will be notified of potential hazards and, by imposing certain conditions, the risks from these hazards will be minimized. There is little by way of detail as to how these zones would manifest themselves, but Wright Nelson (2020a, 605) suggests that measures within a safety zone could include such things as the requirement of filing of advanced travel plans within the zones, maximum speeds for rovers, suggested cordons around areas of high risk, together with details of possible radio interference and possible limits on use of rocket engines.

The suggested use of safety zones to deconflict space activities has raised some questions regarding compatibility with the Outer Space Treaty in two key areas. The first is that creating these zones in which conditions can be imposed is a breach of Article II and amounts to a de facto appropriation. The second is that, even if the creation of a safety zone does not amount to appropriation, it does restrict the freedom of access to all areas of the Moon, as guaranteed by Article I of the Outer Space Treaty. In both cases, this is unlikely. Whilst there may be a limitation on the use of the zoned areas, such limitations would not breach Article I of Article II when read alongside Article IX.

Article XI of the Outer Space Treaty is a broad-ranging provision of the Treaty which contains several distinct elements. It starts by exhorting State Parties to be guided by principles of co-operation and mutual assistance. Crucially, for the purposes of the Accords it requires that all states:

'conduct all their activities in outer space, including the Moon and other celestial bodies with due regard to the corresponding interests of all other States Parties to the Treaty.'

The notion of 'due regard' is a principle that is well recognized in international law, even if it has not been developed in respect of space activity. It imposes a duty on those conducting space activities, requiring that an act in space should be performed to 'a certain standard of care, attention or observance' (Marchisio 2009, 175). Article IX of the Outer Space Treaty also obliges States Parties pursuing exploration in outer space to have due regard to the environment, both in outer space and on Earth, 'so as to avoid their harmful contamination'. Finally, Article IX requires states to consult if they believe their space activities will result in 'harmful interference' (a term not defined in the Treaty).

It is the 'operationalization' of Article IX that the deconfliction element of the Accords are seeking to achieve. Section 11 starts with a clear affirmation of the existing international treaty law. Section 11(11) provides a commitment to respect the principle of free access to all areas of celestial bodies and all other provisions of the Outer Space Treaty in their use of safety zones. Indeed, the Accords go on to provide further commitment to 'adjust their usage of safety zones over time based on mutual experiences and consultations with each other and the international community'. If safety zones are operated in an open and transparent fashion, with consultation at the heart of the process, the contours of Article IX will start to come to into sharper focus and space will be safer for all users. The notification of activities that could harmfully interfere with another state's operations in space is something that any future off-Earth settlement will need to consider, and early transparency will help build confidence amongst the international community (Wright Nelson 2020a, 621).

Ultimately, the validity of safety zones will depend on the lunar activities that occur, and the hazards created by such activities. This will determine the way in which the safety zones manifest themselves. Disproportionate or inappropriate use of safety zones will undoubtedly cause tension and lead to conflict between Artemis and non- Artemis users of the Moon, just as the hoarding of off-world resources will lead to disputes about the legality of mining. Nonetheless, the interpretation of these pro- visions of the Outer Space Treaty within the Artemis Accords has been made in the context of an imminent mission to the Moon. This is understandable given that the Accords were negotiated as part of Project Artemis. If the broader role of the Accords is in shaping normative behaviour for off-world settlements is to be considered, it is necessary to look beyond the Moon and examine the broader legal framework for the settlement of humans in deep space.

6. An International Treaty—Return to the Moon Agreement?

The question then arises, if the Accords are not acceptable, or if they are only appropriate for the scope of Project Artemis, what is the alternative? The current geopolitical situation means that any treaty negotiation will have formidable hurdles to overcome if consensus is to be achieved (Danilenko 2016, 183). It should also be noted that there have been significant international efforts to resolve the specific legal questions regarding space mining, such as the Hague International Space Resources Governance Working Group and the subsequent promulgation of the building blocks (Bittencourt Neto, Masson-Zwaan, and Hofmann 2020). Despite this, and the positive developments in establishing a working group within UNCOPUOS, progress on the issue has been slow. Given that the Artemis Accords are open only to 'like-minded partners' an internationally agreed template for human settlements seems some way off.

One possible alternative, posited by a range of academics is the potential revivification of the Moon Agreement 1979 (e.g. Hobe 2010). Opened for signature on 18 December 1979, the Moon Agreement is the last of the 'children' of the Outer Space Treaty (OST), following on from the Rescue Agreement (1968), the Liability Convention (1972), and the Registration Convention (1976). Taken together with the OST, the provisions of which the Moon Agreement purports to 'define and develop', the 1979 Agreement was intended to be the international blueprint for the establishment and regulation of extra-terrestrial settlements (Tronchetti 2017, 782).

Indeed, many of the Articles of Moon Agreement are essentially restatements of core principles of international law and of the Outer Space Treaty in particular. Thus, of the Moon Agreement, Article 2 provides that all activities on the Moon are to be conducted in accordance with international law and the Charter of the United Nations in particular. Article 3 carries forward the provisions of Article IV of the OST, restating that the Moon is to be used for exclusively peaceful purposes and prohibiting the militarization of the Moon and its orbit.

Article 6 provides that there shall be freedom of scientific investigation on the Moon by all States Parties (essentially rehearsing the second paragraph of Article I OST). However, Article 6(2) elaborates upon the OST by providing that, whilst con- ducting scientific investigations, States Parties have the right to collect and remove samples of minerals from the Moon, though such states should also 'have regard to the desirability of making a portion of such samples available to other interested States Parties and the international scientific community for scientific investigation'. Article 6(2) further provides that

[s]uch samples shall remain at the disposal of those States Parties which caused them to be collected and may be used by them for scientific purposes ... States Parties may in the course of scientific investigations also use mineral and other substances of the Moon in quantities appropriate for the support of their missions.

In the Articles cited above, there could be nothing of any concern to any State Party to the OST. Indeed, Article 6(2) seems to provide a sensible and practical solution to questions concerning whether the collection and retention of minerals from celestial bodies for scientific purposes (and use of them in support of scientific missions) breached Article II of the OST (the prohibition of national appropriation of any part of outer space).

Despite these similarities with the OST and, indeed, the synergies with the provisions of the Artemis Accords, the chances of the Moon Agreement being revived at the current time are small. Article 7 obliges States Parties to 'take measures to prevent the disruption of the existing balance of [the celestial body's] environment, whether by introducing adverse changes in that environment, by its harmful contamination through the introduction of extra-environmental matter or otherwise'. This wording could place a significant economic burden on those seeking to establish settlements with a view to resource extraction (Newman 2015, 33).

It is, however, the provisions contained in Article 11 of the Moon Agreement which have ultimately limited wider adoption of this Treaty. Article 11(1) holds that '[t]he Moon and its natural resources are the common heritage of mankind'. Article 11 then goes on to give some notion of the implications of this concept. In Article 11(5), the Agreement provides that States Parties undertake to 'establish an international regime ... to govern the exploitation of the natural resources of the Moon'. Then, Article 11(7) spells out what that international regime is mandated to achieve, amongst which is Article 11(7)(d):

An equitable sharing by all States Parties in the benefits derived from [the Moon's] resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon, shall be given special consideration.

Ironically, in trying to achieve a coordinated and cooperative approach to the utilization of space resources, Article 11 has essentially achieved the opposite. The incorporation of 'common heritage of mankind' (and its precise meaning) was a contentious issue during the negotiations of the Agreement and has remained so even after the Agreement was reached (Tronchetti 2010, 506). The difficulty arises from the inclusion of 'equitable' in Article 11(7)(d).

As Tronchetti (2010, 511) points out, there are two competing interpretations of the meaning of 'an equitable sharing ... in the benefits derived from those resources'. On the one hand, it could be taken to mean that resources and benefits derived from exploitation of celestial bodies are to be shared equally with all states irrespective of whether they have played any role in such exploitation (the interpretation contended for by developing countries). The counterpoint is that it could be interpreted as 'equal' in the literal sense of that word, meaning that those States who are actively engaged in the exploitation activities have a greater say in how the benefits are shared (the definition favoured by developed countries).

Tronchetti (2010, 511) also notes that, in addition to the contested definition of 'equitable' there is also much uncertainty over what is meant by the 'benefits' that are to be equitably shared. Are those benefits the profits of the activities? Or does it mean the sharing of the actual resources themselves? Does the term 'benefits' extend to the technology developed to extract resources? The vagaries attached to the Common Heritage Principle (Newman 2015, 34) and the ambiguities regarding the extent of resource sharing, coupled with the indeterminate nature of the body that will oversee such distribution means that states will be unlikely to commit to future exploration where such crucial concepts are unclear.

The Moon Agreement potentially provides a framework in circumstances where exploration of celestial bodies and extraction of celestial resources is being conducted by States Parties who are prepared to work together in a coordinated manner and harmonious spirit. However, those were not the prevailing circumstances at the time of the Moon Agreement, and they are not the circumstances that prevail now. The current geopolitical reality means that celestial resource extraction is likely to be extremely competitive. Furthermore, it is likely that the conduct of such activity will require the investment of significant amounts of private capital. The uncertainties created by the Moon Agreement do not support a commercially coherent case for such investment.

The Moon Agreement has been ratified by only 18 states and signed by an additional four states. Neither China nor Russia have ratified or signed the Agreement and in 2020 President Donald Trump rejected the notion that the Moon Agreement governs 'the promotion of commercial participation in the long-term exploration, scientific discovery, and use of the Moon, Mars, or other celestial bodies'. This repudiation expressly signalled to the world that the United States does not consider the Moon Agreement to reflect international law regarding lunar exploration.

7. Agreement and Consensus for Future Settlements

The competing opinions over the compatibility of provisions of the Artemis Accords with the Outer Space Treaty and the apparent repudiation of the Moon Agreement should not convey the impression that a solution for the governance of non-terrestrial settlements is unobtainable. There are a great many areas of shared agreement. Indeed, it is worth re-emphasizing that existing elements of international space law will still apply.

The Outer Space Treaty permits states to undertake the exploration, use of outer space, including the Moon and other celestial bodies. It also enshrines freedom of scientific access and freedom of access to space without discrimination. Non- appropriation of celestial bodies and the incorporation of international law have already been discussed. Article IV of the Treaty prohibits the stationing of nuclear weapons and weapons of mass destruction in outer space or on celestial bodies. Whilst Article V inter alia lauds astronauts as 'the envoys of mankind' (a figure of speech intended to emphasize that early space travellers who landed in hostile territory should not be used as political prisoners). More significantly Article V creates the humanitarian duty (reflected in Section 6 of the Artemis Accords) to take all reasonable efforts to offer all possible assistance to astronauts in distress (Von der Dunk and Goh, 2009, 97–8).

Within the Accords themselves, there is a great deal that has been welcomed. The notion of interoperability is already well-established as a desirable element of collaborative space ventures. Defined as 'the ability of a system to work with or use the parts or equipment of another system' (Salmeri 2020) interoperability has the potential to greatly reduce the expense for new state actors to embed existing, proven technologies within their infrastructure at a greatly reduced development cost. The establishment of common standards across a range of space-based applications has considerable safety benefits, allowing the creation of standard, universal docking mechanisms and other connectors. There are some potential problems associated with interoperability, such as the potential for commercial operators to use the standard systems to try and leverage commercial advantage, but as can be seen from the International Space Station this has not come to pass and the advantages far outweigh potential concerns. Future, off-world settlements would benefit greatly if all the design of all systems started from the premise of being interoperable with other the systems of other settlers.

The potential for scientific discovery by non-terrestrial settlements on other celestial bodies is perhaps one of the most exciting aspects of human exploration beyond Earth and the Moon. Given that NASA has exhibited a long-standing commitment to the sharing of data (Johnson 2020b) it is not surprising that there is a stand-alone commitment under Section 8 of the Accords to the open sharing of scientific data. Any discovery, including the potential discovery of life, will be subject to rigorous scrutiny and scepticism, the immediate dissemination of scientific data would seem to be a logical starting point for any human settlement. It is significant that the duty to share data will not be extended to private companies, ensuring that there will not be any conflict with potential intellectual property rights.

The principle of transparency is crucial to demonstrating the good faith of those involved in the Artemis Accords. Article IX of the OST places the principles of cooperation and mutual assistance at the heart of how

space should be used and explored. From both a security and a scientific standpoint, openness of activity will go a long way towards dispelling some of the tensions that have been outlined. Whilst active cooperation cannot be imposed on states, an entrenched commitment to transparency will ensure that the potential for misunderstandings and conflicts is significantly reduced. A commitment to transparency should be embedded at the very heart of any future legal framework governing off-world settlements.

Notwithstanding these areas of consensus there are some omissions from the Accords that a sustainable off-world settlement would do well to consider. First, the environmental protections afforded by the Accords are limited to the prevention of lunar orbital debris. There is no distinct planetary protection policy. This is explicable as the Moon is largely regarded as lifeless, and there have been numerous sample return missions without any contamination. Additionally, there is a declaration at the start, acknowledging the benefits of coordination via multilateral forums. Whilst not explicitly mentioning it, the Committee on Space Research (COSPAR) would be likely to come within such fora and it has well established planetary protection guidelines (Cheney et al. 2020).

More broadly, any underpinning framework for a human settlement will need to consider the relationship of the settlement to the surrounding environment. From both an ecological and a scientific perspective, the way in which human settlers inter- act with another celestial body will be crucial. It is suggested that the embedding of measures to protect the environment of another celestial body is a fundamental concept that needs to be agreed at the outset of any mission. Mining is an inherently invasive and disruptive process to any environment. To be more than scavengers of the natural resources, the environmental impact of the settlement must be mitigated as far as possible (Newman 2016, 233).

Finally, there are wider political arrangements that will need to be considered as humans move beyond the Earth and the Moon. The distances between the Earth and the Moon mean that nation-states and the role of geopolitics will still be the determining factor in the overall governance of lunar settlements. The Artemis Accords, for example, make no reference to human rights—and this is perhaps understandable given the 'like-minded partners' that are signing up. But as settlements drift further away from the influence of the Earth, real-time communication will not be possible and the reliance on supplies from Earth diminishes, and then settlers will be forced to consider the relationship with Earth and with the nation-states that comprise our civilization.

Language is not neutral and in analysing a governance framework for off-world excursions, this discussion has been careful to use the word settlement as opposed to colony. The notion of colonialism is inextricably tied up with historical repression and conquest of Indigenous people (Ferrando 2016, 138). Those looking to settle on other celestial bodies must contemplate exactly what type of venture they are engaged upon when establishing their settlement. Robinson (2006) recognized that there may come a time when human settlers may wish to disestablish themselves from the ties to nations and geopolitics. This is foreseeable and should be within the contemplation of those establishing a blueprint for a settlement on a celestial body away from the influence of the Earth but is clearly not within the remit of the Artemis Accords.

Establishing the granular details of governance for an off-world settlement will largely depend on the infrastructure that emerges and is well beyond the purview of this discussion. There have been some attempts to identify what kind of political system might emerge once a settlement becomes established and has moved beyond the initial stages of simply surviving (Schmidt and Bohacek 2021). Indeed, Robinson (2006) has attempted to identify what a constitutional arrangement for a settlement on a celestial body away from Earth might look like. This is where we reach the boundary between the predictable developments that will occur because of Project Artemis and the longer-term journey of humanity as a spacefaring civilization.

8. Conclusion

With the Moon Agreement seemingly beyond the pale, the Artemis Accords are a tacit recognition that securing a meaningful, binding treaty is not practical given the current geopolitical landscape and the number of states now actively involved in UNCOPUOS. Once the United States decided to return to the Moon, the lack of consensus meant that there was little alternative but to try and establish a series of normative principles upon which to proceed. Notwithstanding the repeated claims of adherence to existing

space treaties, the decision of the United States to open the Accords only to 'like-minded partners' could see a fracturing of consensus and compromise and open the floodgates to bilateral law-making.

The danger of a 'fractured' Moon, with different legal and political agreements governing activity, poses a risk to safety and threatens wider stability and security (Wright Nelson 2020b, 5). In addition, the move away from consensus and compromise means that the negotiating position of different states could become asymmetrical. It will, after all, be the United States that determines the qualification as a 'like-minded partner' for Project Artemis. As has been pointed out, the benefits of dialogue and cooperation between non-like-minded states was clearly demonstrated in the Apollo- Soyuz Test Project of the 1970s (Mosteshar 2020, 603). Human space exploration would be ineffably weakened if such projects were to become impossible. Discussions and negotiations in UNCOPUOS are a way that nations can keep lines of communication open.

There are the basic principles upon which agreement was reach amongst the inter- national community at the time the Outer Space Treaty was promulgated. There is still broad consensus that the Treaty and the law-making process within UNCOP- UOS are the ways in which the regulation of space activity is the preferred way to develop international law regarding outer space activities. Advocates of the Accords point to Section 10(4) which commits to ongoing discussions at the UNCOPUOS as to how the legal framework on resource utilization will develop. Critics of the Accords have countered that UNCOPUOS is the proper forum for interpreting the provisions of the OST and that the Accords serves to undermine inclusive international discussions (Mosteshar 2020, 602), but both at least recognize that UNCOPUOS must play a significant role in the development of international space law from now on into the future.

Merely signing the Accords does not breach the OST. Concern has been expressed over the mining of space resources and the potential implications of deconfliction activities, but in truth the technology and infrastructure to enable commercial lunar mining is still some way in the future. The establishment of functioning, independent settlements on celestial bodies away from the Earth and Moon is yet further into future. These tentative footsteps away from Earth heralded by Project Artemis rep- resent a chance to explore shared values held by even the most implacably opposed States. By embedding the OST within the fabric of the Artemis Accords, the United States and partner states have acknowledged the importance of the rule of law. Per- haps it is that recognition coupled with the acknowledgement that cooperation and guarantees of mutual assistance are fundamental for safe and sustainable activities in space that provides the most significant legacy for future settlements.

Notes

1. See e.g. the work undertaken by 'For all Moonkind' <https://www.forallmoonkind.org/> accessed 5 July 2022.
2. The term 'like-minded partners' has been used extensively by the NASA to describe those states which might wish to sign up to the Artemis Accords. See e.g. <https://2017- 2021.state.gov/dipnote-u-s-department-of-state-official-blog /space-exploration-and- the-artemis-accords/index.html> accessed 29 January 2022.
3. See for further details 'Working group established under the Legal Subcommittee agenda item "General exchange of views on potential legal models for activities in the exploration, exploitation, and utilization of space resources"', available online at <https://www.unoosa. org/oosa/en/ourwork/copuos/lsc/space-resources/index.html> accessed 5 July 2022.

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