Constructing a Regulatory Regime for the Exploitation of Resources on the Moon and Other Celestial Bodies: A Balancing Act

Jason R. Bonin[1] & Fabio Tronchetti[2]

Abstract

Law can be both a catalyst and consequence of technological change. Nowhere is this fact more clear than in the realm of space law. Man's initial ascent to space was manifested not only through scientific discovery, but also through legal innovation, as both a means of keeping up with and shaping the use of outer space. During the initial period of space exploration, legal norms were developed in a world of state actors, designed to promote the continued peaceful use of space and to prevent claims of dominion or sovereignty. Since that time, further technological development and shifts in economic ideologies have shifted the focus from government-based exploration to private entity-based exploitation, particularly with respect to the moon and other celestial bodies. This article evaluates the legal landscape in outer space. Interested parties maintain three legal positions in relation to the exploitation of extraterrestrial resources located on such bodies. The first holds that we need to revisit space law in order to create the legal certainties required to harness the innovatory capabilities of the private sector, citing the need for real property rights to successfully achieve this end. The second, asserted by an increasing number of "entrepreneurs", claims that space law does not prevent private citizens from claiming ownership of extraterrestrial real estate. While these claims are bogus, attempts at enforcement and a growing belief in their validity may retard the development of legitimate commercial ventures. The third position, principally held by developing states, is

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[1] B.A., J.D., University of Florida; LL.M. (Adv.), *cum laude*, Leiden University, Netherlands. The author is currently a Ph.D. candidate at the National University of Singapore, where he is researching air transport liberalization in East Asia. Questions or comments can be addressed to jason.bonin@gmail.com.

[2] Associate Professor of Law and Associate Director, Space Law Research Institute, School of Law, Harbin Institute of Technology, People's Republic of China. He can be reached by e-mail at fabio.tronchetti@yahoo.com.

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the benefits derived from extraterrestrial resources should be shared by all, and that a mechanism for the equitable redistribution of such benefits needs to be put in place. The article argues that the current regime is largely adequate to deal with issues of outer space. However, the law is unclear in relation to the level of resource extraction permitted by the Outer Space Treaty. It further argues that, while the issue is not imperative, this situation is undesirable in the long term, and examines past controversies in outer space law to determine an ideal path towards the resolution of the issue.

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I. INTRODUCTION

Law can be both a catalyst and consequence of technological change. This statement is particularly evident in the realm of space law. Over the past sixty years, the possibilities for the exploration and utilization of extraterrestrial resources has transformed from visionary dream to popular reality. Man's initial ascent to space was manifested not only through scientific discovery, but also through legal innovation in the international arena, functioning as both a means of keeping up with and shaping the many use of outer space.

During the initial period of space exploration, legal norms were developed in a world of state actors and were designed to promote its continued peaceful use and to prevent exclusionary acts through claims of dominion or sovereignty.[3] Since that time, further technological development, political change and shifts in economic ideologies have shifted the focus from government-based exploration to private entity-based exploitation. Private actors are competing with government entities in the areas of launch[4] and telecommunications satellite services.[4] Military technologies such as GPS are finding global markets in the private sector. The United States has restructured its legal framework to accommodate commercial space flight,[6] and space tourism has moved beyond the stuff of science fiction into the realm of being technologically, and commercially, possible.[7] While these

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3 *See generally*, G.A. Res. 1962 (XVIII), U.N. Doc. A/5515 (Dec. 13, 1963); G.A. Res. 1721 (XVI), U.N. Doc. A/5026 (Dec. 20, 1961). These principles were codified in the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty]. Many of the general principles contained in the Outer Space Treaty are seen as customary international law.

4 Commercial Space Launch Act, 49 U.S.C. §§ 2601-2623 (1984). Commercialization has been protected from unfair competition by the United States by three agreements with foreign countries, namely, Russia, China and the Ukraine.

5 *See* 47 U.S.C. § 763 (2000).

6 *See generally*, Commercial Space Launch Amendments Act, 49 U.S.C. § 701 (2004), *construed in* Spencer H. Bromberg, *Public Space Travel – 2005: A Legal Odyssey into the Current Regulatory Environment for United States Space Adventurers Pioneering the Final Frontier* 70 J. AIR L. & COM. 639 (2005).

7 *See* Zhao Yun, *A Legal Regime for Space Tourism: Creating Legal Certainty in Outer Space* 74 J. AIR & SPACE L. 959 (2009).

developments have historically had a geographical base in the United States, commercial space is taking off as a global phenomenon.[8]

One area of interest in the commercial development of space relates to the potential benefits of resource extraction from the surface and subsurface of the moon and other celestial bodies. Celestial bodies are potentially an important source of valuable natural resources. Several lunar missions have demonstrated that the moon is rich in iron, aluminum, oxygen, potassium, hydrogen, manganese and chromium. The moon also contains a substance called Helium-3, which, combined with other materials, can be used as fuel in fusion power reactors. While the facilities necessary to develop a continued presence on the moon has yet to materialize, Japan, China and India all have near-term lunar research programs, with Japan aiming to build a scientific research center on the moon by 2020.[9]

International law prohibits the "national appropriation" of outer space, including the moon and other celestial bodies.[10] It also provides states the right to freely explore and use outer space on a non-discriminatory basis, free access to outer space, the right to freely investigate outer space for scientific purposes, and declares that such exploration and use "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".[11] These principles have led to a number of claims. On the one hand, both developed states and private enterprise claim that the lack of legal certainty with respect to extraterrestrial property rights in both land and resources extracted therefrom hinders the development of the technology required to exploit such resources. On the other hand, developing countries hold that the principles declared in Article I of the Outer Space Treaty are binding principles which require the redistribution

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8 *Global Award for Indian Space Agency's Commercial Arm*, SPACE MART (May 18, 2010), http://www.spacemart.com/reports/Global_Award_For_Indian_Space_Agency_Commercial_Arm_999.html.

9 *Japan Draws Plan to Build Research Center on Moon*, MOON DAILY (May 27, 2010), http://www.nasa.gov/vision/universe/solarsystem/hubble_Moon.html.

10 Outer Space Treaty, *supra* note 3, art. II.

11 Outer Space Treaty, *supra* note 3, art. II.

of benefits, derived from exploitative activities, to all nations. Still another set of "entrepreneurs" have claimed actual ownership of the moon and other celestial bodies. Such claims are premised on a common argument that since the Outer Space Treaty prohibits only 'national' claims, private claims are permitted by international law.

This article evaluates the different contentions with respect to resource extraction on the moon and other celestial bodies. Section II addresses the *lex lata* as it relates to property rights in celestial bodies and resources found thereon.[12] While the law is clear as to property rights in land and in fixtures on the land, it is less clear on resources extracted from those bodies. This situation is unsupportable, as an unrestricted right of extraction would create a sub-optimal and potentially unsustainable system of exploitation, while a legal regime unduly restricting exploitative ventures through disincentives to proprietary interests could stymie the technological innovation necessary to develop such activities – positions which are likely to be taken by developed and developing countries respectively. Section III turns briefly from this discussion to address the claims of 'extraterrestrial real estate developers'. It demonstrates them to be false, both in terms of established legal doctrine as well as of conflicts between their claims and the principles of free exploration and use contained in the Outer Space Treaty. Section IV returns to the debate between development and distribution, exploring the need to balance these two positions through a comparison of the failure of the Moon Agreement with the success of the 1988 World Administrative Radio Conference (WARC-ORB-88). Section V draws the article to a close.

II. EXTRATERRESTRIAL PROPERTY RIGHTS IN LAND AND RESOURCES

Despite the number of claims to the contrary, space law already contains a high level of legal certainty in relation to most aspects of property rights. These rights are primarily spelled out within the provisions of the Outer

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12 Indeed, the regime generally follows the Roman law principles related to *res communes*. *See* THE INSTITUTES OF JUSTINIAN 1-2, 5, 18 (J.T. Abdy & Bryan Walker trans. 1876).

Space Treaty.[13] In addition to the rights contained in the *corpus juris spatialis*, the International Telecommunications Union (ITU) developed a property right of sorts relating to the use of the limited number of orbital slots and frequencies within the geostationary orbit, or GSO,[14] and the inter-governmental agreement on the International Space Station contains some provisions on the ownership of intellectual property rights for objects developed in space.[15]

Of the rights mentioned above, our concern is with the principles delineated in the Outer Space Treaty, and particularly in relation to three classes of objects. Those objects are extraterrestrial property rights in land, property rights in objects affixed to the moon or other celestial bodies and resources extracted from such bodies. This section examines each in turn to determine the law applicable to the individual parts.

A. The Non-Appropriation Principle and Claims to Rights in Land

Article II of the Outer Space Treaty provides that, "[o]uter 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".[16] This principle, referred to as "the non-appropriation principle",

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13 *Id.* In addition, the Moon Agreement attempted to introduce additional principles to the legal framework, such as those related to the need to maintain the environmental integrity of the celestial body explored or exploited and the principle that the Moon and its natural resources were the "common heritage of mankind". These rules were never accepted by the majority of states, and as a result the Agreement has received an extremely low number of ratifications. *See* Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, arts. 7, 11, Dec. 18, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement] (As of 2005, there are only 16 signatures and 11 ratifications. Of the space-faring nations, only France and India have signed the Agreement, and both have failed to ratify it.). *See also* Henry R. Hertzfeld & Frans von der Dunk, *Bringing Space Law into the Commercial World: Property Rights without Sovereignty* 6 CHI. J. INT'L L. 81, 85 (2005).

14 Hertzfeld & von der Dunk, *supra* note 13, at 83.

15 Agreement among the Government of Canada, Governments of the 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 ,art. 21, Jan. 29, 1998, T.I.A.S. 12927. *See also* Hertzfeld & von der Dunk, *supra* note 13, at 83-84 (citing, in addition to the inter-governmental agreement, a NASA directive on IP developed on the ISS).

16 Outer Space Treaty, *supra* note 3, art. II. For an analysis of Article II of the Outer Space Treaty, *see* S. Gorove, *Interpreting Article II of the Outer Space Treaty*, PROC. ELEVENTH COLLOQUIUM ON L. OUTER SPACE 40 (1968); L. Tennen, *Article II of the Outer Space Treaty, the Status of the Moon and Resulting Issues*, PROC. FORTY-SEVENTH COLLOQUIUM ON L. OUTER SPACE 520 (2004).

was a watershed in international law. With this, the parties to the Treaty effectively and emphatically ended claims of outer space being *terra nullius*.[17] With relation to states, the possibility to claim sovereignty over this final frontier effectively ended with the non-appropriation principle becoming customary international law.

With respect to states, Article II draws a distinction between the concepts of *imperium* and *dominion*, a distinction drawn by natural law, as carried over from Roman law. Vattel noted that the relationship between the state and the territory it governed consisted of two elements. The first element consisted of the domain, a specified area of land which the state owned and the benefits of which could be derived exclusively by the state.[18] The second element was that of empire, or the sovereign command.[19] By including use, occupation or "any other means" within the scope of its provisions, Article II explicitly extends beyond claims of sovereign command to situations of *de facto* control of property without the assertion of sovereign jurisdiction.[20]

Apologists for a private right of appropriation base their arguments on the definition of the term "national". They argue that while sovereign rights are excluded from outer space by the non-appropriation principle, private rights of ownership remain undisturbed. This argument ultimately turns on a theory of property rights as antecedent and qualitatively superior to sovereignty, creating a conflict ultimately rooted in the debate between the jurisprudence of natural law – and particularly arguments based on the political theory of John Locke – and positive law.[21] While the philosophical contentions

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17 *See* GEORG SCHWARZENBERGER & E.D. BROWN, A MANUAL OF INTERNATIONAL LAW 93(6th ed. 1976). The authors note that, while the UNGA resolutions preceding the Outer Space Treaty prohibited sovereign appropriation under international law, as General Assembly resolutions they were only arguably binding upon the parties. With both space powers parties to Outer Space Treaty, any argument that outer space could be appropriated by states was effectively shattered.

18 *See* EMMERICH DE VATTEL, THE LAW OF NATIONS BOOK I § 204 (1758); MALCOLM SHAW, TITLE TO TERRITORY IN AFRICA: INTERNATIONAL LEGAL ISSUES 12 (1986).

19 *Id.*

20 Article II thus provides for the contentious issues relating to *res communia* identified by Shaw. *See* SHAW, *supra* note 18. ("Whether [the distinction between property and sovereignty] could be used to solve problems relating to the use of *res communia*, such as the sea-bed, is more doubtful.")

21 *See* Kurt Anderson Baca, *Property Rights in Outer Space* 58 J. AIR L. & COM. 1041 (1992-93).

underlying this debate extend far beyond the scope of this article, it is worth noting some of the problems related to such an interpretation. This article will briefly outline three significant hurdles to such a jurisprudential argument, two based in the terms of the Outer Space Treaty itself, and one grounded in natural legal theory.

The first problem relates directly to the interpretation of the term 'national' as used within the treaty. In addition to Article II, the term 'national' as a descriptor appears in relation to states' responsibility for its "national activities" in outer space.[22] That provision, contained in the first sentence of Article VI of the Treaty, provides, in relevant part:

> 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 by 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.[23] (emphasis added)

The interpretation of treaties requires that the terms of the treaty be read in the context of the agreement. Context is set by an interpretation not of each provision on a stand-alone basis, but in the context of the treaty as a whole.[24] Thus, absent a specific reason to the contrary, one would expect the term 'national' to maintain the same meaning as to the classes of activities, e.g. governmental and non-governmental, which it covers. Approached from a different perspective, one would similarly expect that the scope of national

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22 *See* Outer Space Treaty, *supra* note 3, art. VI, art. IX. Article IX refers to "nationals" as parties outside of the governmental structure ("If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment.").

23 Outer Space Treaty, *supra* note 3, art. VI. Article VI goes on to require the "appropriate state" to both authorize and continuously supervise the activities of non-governmental entities, and further provides that in the case of space activities conducted by international organizations the member states of that organization will share the responsibilities ascribed by the Treaty.

24 International Law Commission, *Draft Articles on the Law of Treaties with commentaries* 2 Y.B. INT'L L. COMMISSION 187, 221 (1966) (citing *Competence of the ILO to Regulate Agricultural Labour, P.C.I.J.* (1922), Series B, Nos. 2 and 3, p . 23).

appropriation would include the types of actions included within the broader term of national activities, since appropriation can be classified as a particular subclass of action falling within the umbrella of a wider class of actions i.e. 'activities'.

A second issue relates to the concept of 'mankind' as a class of legal subject and, in the particular context of outer space law, what is meant by "[t]he exploration and use of outer space, including the Moon and other celestial bodies, … shall be the province of all mankind".[25] This tree bears fruit in the form of two questions. The first such question is whether the idea of the "province of mankind" was intended merely as a political exhortation of ideals or reflects the intention to form a truly new category of law.[26] There was indeed a drive in the 1960s towards exploring a "law of mankind", brought out by a collective concern to prevent a declaration of war in an era of mutually assured destruction.[27] A corollary to the first question and one much more difficult to answer is whether, if mankind as a collective unit was intended to become a subject of international law, such extension was in fact created. The developed world's, and particularly the United States's, rejection of the "common heritage of mankind" principle brought much of the collective impetus developed throughout the 1960s to a close. Yet the rejection of the "common heritage" principle has much to do with the particular rules on the distribution of the benefits of exploitative activities, and not with a conceptual disagreement with mankind as a whole as an object of international law.

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25 Outer Space Treaty, *supra* note 3, art. I. *See* Ernst Fasan, *The Meaning of the Term "Mankind" in Space Legal Language* 2(2) J. SPACE L. 125 (1974). Beyond the scope of space law, *see generally* Harry W. Jones, *Law and the Idea of Mankind* 62(5) COLUM. L. REV. 753 (1962). *But see* Adrian Bueckling, *The Strategy of Semantics and the "Mankind Provisions" of the Space Treaty* 7 J. SPACE L. 15 (1979).

26 *See* Fasan, *id.*

27 *See* Fasan, *supra* note 25, at 127-30 (surveying the works of Zhukov, Jenks, Gal, Cocca Gorove and Lachs); Jones, *supra* note 25. One of the strongest proponents of the "law of mankind" movement was Aldo Armando Cocca: *see* Aldo A. Cocca, *The Supreme Interests of Mankind vis-à-vis the Emergence of Direct Broadcast* 2 J. SPACE L. 83, 83 (1974) ("In the present state of interdependence of peoples, all national activities extending beyond the frontiers of the country of origin must be limited and conditioned according to law. The international community is steadily progressing in the elaboration of a more perfect law of mankind, independently from the law of States individually considered. Those areas of specialization which are most developed at the moment, such as human rights, atomic energy law, the law of the sea-bed and ocean floor, the protection of the environment and, particularly, the law of outer space, are contributing toward this new expression of man in society and in the planetary dimension.")

A second question relates to the scope of the provision. Article I refers to the "exploration and use" of outer space as being the province of mankind, and not to outer space itself. Proponents of private property rights in extraterrestrial land claim that this provision does not prohibit private claims to land, so long as access to outer space, including celestial bodies, remains open to exploration and use by states. While there is no explicit denial of claims to private property contained within the Article, some practical problems with such an interpretation remain. Most importantly, the free exploration and use of outer space accorded to states by Article I create a fundamental conflict with the right of exclusive use associated with private property. While not addressed in the actual case, the case of *Nemitz v. United States*[28] illustrates the potential conflict between the freedom of exploration and use granted in the Outer Space Treaty with the incentives derived from the exclusive use of private property.[29]

A third issue relates to the context of private property rights within the context of natural legal theory itself. Within that theory, the idea of the creation of private property rights refers to the development of social relationships pre-existing the formation of the political association of the state.[30] Jurists, however, are not of one opinion where the state exists, even within the natural law tradition. Vattel's own opinion shows that once a state has been formed, the cumulative domain of the individuals comprising the state equals the domain of the state itself:

> Even the property of the individuals is, in the aggregate, to be considered as the property of the nation, with respect to other states. It, in some sort, really belongs to her, from the right she has over the property of her citizens, because it constitutes a part of the sum total of her riches, and augments her power.[31]

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28 2004 WL 3167042 (D. Nev. 2004).

29 *See infra*, Part III.B.

30 HENRY SUMNER MAINE, ANCIENT LAW 243-48 (reprinted in Classics of Anthropology series, Ashley Montagu ed. 1986) (referencing, *inter alia*, the English jurist William Blackstone and German jurist Friedrich Carl von Savigny).

31 EMMERICH DE VATTEL, THE LAW OF NATIONS BOOK II § 81 (1758). In the case of the modern corporation, whose very existence relies on a legal fiction of the state, would fall within the category of persons within the state.

Additionally, Vattel draws a distinction between the 'high domain', which is the country over which the state extends its sovereignty, and the 'useful domain', corresponding with the rights belonging to the individuals in the state.[32] The latter can be separated from sovereignty and may exist in other jurisdictions, in which case they are possessed as private individuals.[33] Vattel's position largely supports extending Article II of the Outer Space Treaty to the acts of private individuals.

B. Objects Affixed to the Moon or Other Celestial Bodies

Whereas Article II removes the possibility of states to claim either *dominium* or *imperium* over outer space, including any celestial bodies contained therein, the state of registry explicitly retains jurisdiction and control over space objects launched into outer space, including the personnel onboard, and irrespective of whether the object is in outer space or on a celestial body such as the moon.[34] Moreover, Article VIII recognizes that persons retain the rights of ownership in the objects launched into space, including those landed or constructed on a celestial body.[35]

While some commentators have noted an inherent conflict between the provisions of Articles II and VIII of the Outer Space Treaty,[36] the tension between the two provisions is one of general scope and not specific to space law. Indeed, such tension exists within any space of open-access where the ability to control the actors within that space remains fragmented. In this regard, the key element functionally differentiating space law from the law relating to vessels operating on the high seas is the removal of the territorial element from the command-control function in space law.

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32 *Id.*, § 83.

33 VATTEL, *supra* note 31, at § 83.

34 Outer Space Treaty, *supra* note 3, art. VIII.

35 Outer Space Treaty, *supra* note 3, art. VIII. Hertzfeld and von der Dunk have noted that there are "no clear rules" as to objects made in outer space and constructed entirely of extraterrestrial materials: *see* Hertzfeld & von der Dunk, *supra* note 13, at 83 ("With regard to any structure essentially made from locally available resources, there are no clear rules, and it may be valuable to establish clarity on this subject.")

36 *See* David Goldman, *Settlement and Sovereignty in Outer Space* 22 U. W. ONTARIO L. REV. 155, 159-60 (1984); Baca, *supra* note 21, at 1066-67.

C. The Exploitation of Resources on the Moon and Other Celestial Bodies

Of the rights and obligations with respect to property rights in outer space, the most unclear remains the extent to which states can exploit the natural resources found on the surface of celestial bodies.[37] Most commentators agree that some right of exploitation exists. There is also limited practice confirming this, as both the United States and the Soviet Union have removed samples from the lunar surface and brought them to earth. In each of these circumstances, no state voiced any opposition to either state's conduct.[38]

However, there is some uncertainty as to the extent of the right to extract natural resources from those bodies. This degree of uncertainty is sometimes reflected directly in commentators' own vacillation between an unfettered right to exploit and the uncertainty created by unclear legal provisions. The following comment notes both an unconditional right to extract resources from celestial bodies and a chilling effect resulting from uncertainty in the legal regime:

> Anything taken from space and returned to the earth becomes the property of the person, company, or government that performs the action, given the absence of United Nations treaty provisions prohibiting such ownership. Added legal certainty may eventually become necessary to prevent the undue stifling of relevant private interests, especially with regard to minerals and other potentially valuable resources that could be mined from celestial bodies. But as nations become increasingly aware of the possibility of inflicting environmental damage on celestial bodies, most will likely limit any government or private activity that might endanger lunar or other celestial environments.[39]

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37 *See* Hertzfeld & von der Dunk, *supra* note 13, at 82-86. Also noting the lack of international law on intellectual property rights developed in outer space, Hertzfeld & von der Dunk, *supra* note 13, at 83-84.

38 *See* Alan Wasser & Douglas Jobes, *Space Settlements, Property Rights, and International Law: Could a Lunar Settlement Claim the Lunar Real Estate It Needs to Survive?* 73 J. AIR L. & COM. 37, 63 (2008).

39 Hertzfeld & von der Dunk, *supra* note 13, at 83.

The passage above implies at least two questions. The first is whether a regime that permits the removal of 'anything' from space really permits an unqualified removal of 'everything' from a particular celestial body. The fact that 'anything' might be less than 'everything' is suggested in a later passage in the same article:

> Property rights exist in space, even without ownership or territorial rights to celestial bodies, although their applicability to resource extraction remains a contentious issue. Exactly what those rights are and how far they may apply to the extraction of resources is still under debate, creating uncertainty for a company looking to invest in such ventures.[40]

That we are asking the question 'if' presupposes that we have not determined the boundary.

The comment also raises a second question relating to the management of exploitative space activities and their potential negative impact on the outer space environment. Again, at least two scenarios exist, and are inevitably linked to the resolution of the first issue. Where space law is interpreted as creating an unlimited right of extraction, the legal regime is thus one of unrestricted open access. This scenario is one described by Garrett Hardin in his famous essay "The Tragedy of the Commons".[41] "Freedom in a commons", Hardin declared, "brings ruin to all."[42] According to Hardin, a commons scenario incentivizes the overuse of a finite resource open to exploitation, which ultimately results in the destruction of the resource used. Hardin illustrated this scenario by imagining a public grazing pasture of finite dimensions which was open to a number of herdsmen. Once the pasture reached its collective capacity, the addition of any new grazing animal would generate a positive and negative utility. Whereas the positive utility would be one and internalized by the individual who increased the size of his herd, the negative utility would be distributed throughout the community so that the portion of the negative utility actually internalized would be less than one.[43] The result was a scenario

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40 Hertzfeld & von der Dunk, *supra* note 13, at 86.

41 Garrett Hardin, *The Tragedy of the Commons* 162 SCIENCE 1243 (1968).

42 *Id.*

43 Hardin, *supra* note 41, at 1244.

whereby the nature of the incentives and disincentives would lead to the overuse and degradation of the resource while minimizing technological innovation to improve productivity. Similarly, a failure to wholly internalize the negative utility presents similar issues even in a second scenario of less-than-complete open access.

Hardin's argument is not without its criticisms. He fails, for example, to account for the possibility that self-regulation could positively constrain the use of a commons. Nevertheless, he presents a powerful argument against an unregulated commons scenario, whether the resource in question is pastureland or the moon. In order to control for the problems associated with an open-access regime, any legal architecture which contemplates the efficient, continued and sustainable exploitation of extraterrestrial resources should confine the impact of the negative utility to the individual who receives the positive utility.

III. EXTRATERRESTRIAL REAL ESTATE: CURRENT CLAIMS AND POTENTIAL ISSUES

"Nothing could be better than to own your own crater".[44] So declares the website of a company called Lunar Registry, which, together with another undertaking named Lunar Republic Society, offers its clients the possibility to buy "your own acre of Moon property, complete with an elegantly engraved and personalized parchment deed certificate" and with full mineral rights over the acquired piece of lunar soil.[45] Nor is Lunar Registry the first, nor the most famous, of a growing number of claims of private ownership of various celestial bodies. A brief browse through the internet is sufficient to identify several websites offering the possibility of purchasing extraterrestrial 'real estate', whether it is on the moon or on the surface of any other planet of our solar system.

While the activities of these 'entrepreneurs', in and of themselves, may be considered little more than a joke, the proliferation of such claims

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44 *Lunar Registry: The International Lunar Lands Registry* (June 1, 2010), http://www.lunarregistry.com/index.html.

45 *Id.*

accompanied by the public perception that such claims are valid can pose a serious threat to the development of commercial space.[46] This section addresses three aspects of extraterrestrial real estate. First, it places the development and scope of such claims in historical context through a non-exhaustive survey of claims to celestial bodies. Second, it discusses the misinterpretation of law and the misallocation of resources that these claims may lead to, if pursued. Third, it highlights actual developments to demonstrate the incompatibility of private property claims with the principles contained in the *corpus juris spatialis*.

A. A BRIEF HISTORY OF PRIVATE CLAIMS TO EXTRATERRESTRIAL REAL ESTATE

While claims to extraterrestrial real estate proliferated simultaneously with the development of space technology, claims to lunar title date back to 15 July 1756, when the Prussian emperor Frederick the Great gifted the moon to a man named Aul Juergens.[47] In doing so, the Prussian emperor also established a line of inheritance – today, this claim is held by Martin Juergens.[48]

It took nearly 200 years for a new claim to arise. In 1955, Robert R. Coles, a former chairman of New York's Hayden Planetarium, claimed ownership of the Moon.[49] In 1962, before the launch of the first lunar probe of the United States, Ranger 3, an individual residing in one of the British dominions sent a telegram to President Eisenhower notifying him that he

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46 *See* Hertzfeld & von der Dunk, *supra* note 13, at 82, 91-92 (noting that "[t]he most threatening current problem surrounding the issue of real property rights in space is in actuality not related to space entrepreneurship. It instead arises from shortsighted greed premised on misinterpretations of treaties and other applicable laws. For example, several companies have been selling land on the Moon and issuing "deeds" to that land, behavior which unequivocally violates space law treaties. If the public perceives that this action is legal, as evidenced by the lack of government willingness in putting a halt to these activities, serious harm could result in the future." *Id.* at 83.).

47 Virgiliu Pop, *The Men Who Sold the Moon: Science Fiction or Legal Nonsense?* 17 SPACE POL'Y 195 (2001).

48 *See id.*; Gyula Gal, *Acquisition of Property in the Legal Regime of Celestial Bodies*, PROC. THIRTY-NINTH COLLOQUIUM ON L. OUTER SPACE 45 (1996). According to Juergens, his title lies somewhere in the German Bundesarchiv. He has also filed a cease-and-desist letter with lunar proprietor Dennis Hope. D. Trull, *The Moon Is Mine*, http://www.parascope.com/articles/1196/Moonw.htm.

49 This event is described by Pop. *See* Virgiliu Pop, *Lunar Real Estate: Buyer, Beware!* http://www.spacefuture.com/archive/lunar_real_estate_buyer_beware.shtml.

had filed a claim to a certain lunar area and that he would consider the United States responsible for any damage the probe may cause to his property.[50] In one of the more creative claims, in 1969, shortly after the success of Apollo 11, a man was arrested in Brazil for selling parts of the lunar soil at a price of $25 each. The defendant rested his defense on the argument that he had sold parcels of the moon to Buzz Aldrin and Lance Armstrong, the two astronauts having gone to the moon to inspect their newly acquired property.[51] The following year a company called Celestial Gardens sold lunar plots indentified on the basis of a United States military map.[52] Further exploration has yielded more audacious claims. In 1992, a company known as Space Pioneers declared that it owned all the planets in the Milky Way, and sold deeds to one-acre parcels on Mars at the price of US$ 29.95 per acre.[53]

The most famous "extraterrestrial real estate" company appears to be Lunar Embassy, founded in 1980 by the American entrepreneur Dennis Hope.[54] While relatively unsuccessful at first, his business received much attention during the new media boom of late 1990's and early 2000's. According to the Lunar Embassy website, thousands of thousands of customers have already bought plots of the moon.[55] As a consequence of this success, Lunar Embassy expanded its range of activities. It started appointing local representatives outside the United States, calling them 'ambassadors' and selling extraterrestrial real estate on other celestial bodies, leading to further commercial success and the occasional courtroom drama. In 2004, Canada jailed the Lunar Embassy ambassador Lisa Fulkerson, accusing her of fraud

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50 *Id. See also* G.D. Schrader, *National sovereignty in space*, PROC. FIFTH COLLOQUIUM ON L. OUTER SPACE 42 (1962). This issue has had no further development, maybe because Ranger 3 failed to reach the lunar surface.

51 According to the salesmen, the Apollo 11 mission was conceived as a means of inspecting Neil Armstrong and Buzz Aldrin's own claims to the Moon purchased from the individual. *See* Pop, *supra* note 47, at 196 (citing David L., *Seller of Fake Moon Rock May Get Prison* (Nov. 2, 2000), http://www.space.com/news/Moon-rock_guilt_001102.html).

52 *Id.*

53 Pop, *supra* note 49.

54 For information on Lunar Embassy, see *Lunar Embassy World Headquarters*, http://www.lunarembassy.com.

55 *Id.*

and theft.[56] In 2005, the business license of the Lunar Embassy in China was suspended and the company fined CNY 50,000 on grounds of speculation, fraud and profiteering.[57] This latter case represents the first occasion in which a national court has declared the activities of extraterrestrial real estate companies illegal.

Lunar proprietors, however, are not only defendants in the courtroom. Claims that national space agencies have infringed on private owners' property rights have also emerged in both national and international contexts. In July 1997, Adam Ismail, Mustafa Khalil and Abdullah al-Umari filed a lawsuit in San'a, Yemen against the National Aeronautics and Space Administration (NASA) requesting the immediate cessation of all Pathfinder operations on Mars pending a verdict of the court.[58] These three individuals argued that Mars belonged to their families for 3000 years and that NASA, by not informing them or asking their permission to carry out its operations, had inadvertently trespassed on their property.[59] The applicants withdrew the case when the Yemeni Prosecutor General threatened them with arrest – only to reappear the next year selling Martian real estate at $2 a square meter.[60]

A second claim against NASA emerged in the form of a federal civil suit in *Nemitz v. United States*,[61] brought by American citizen Gregory Nemitz against both NASA and the United States Department of State for trespassing

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56 *Buy me to the Moon: Earthlings selling lunar landscape*, USA TODAY (Mar. 28, 2004), http://www.usatoday.com/tech/news/2004-03-28-lunar-sales_x.htm (also documenting the interesting case of Rene Veenema, a Dutch national who falsely claimed to sell Lunar Embassy property in the Netherlands); Luna Society International, *Luna Society International: The Official Website of the Moon*, http://www.moon.com.co/; *Buy Me to the Moon: Make Millions Selling Lunar Landscape*, http://www.redorbit.com/news/space/48205/buy_me_to_the_Moon_make_millions_selling_lunar_landscape/index.html.

57 *See Beijing authorities suspend license of "Lunar Embassy"*, CHINA DAILY (May 11, 2005), http://www.chinadaily.com.cn/english/doc/2005-11/07/content_492152.htm.

58 For a description of this case, *see* W. White, *Interpreting Article II of the Outer Space Treaty*, PROC. FORTY-SIXTH COLLOQUIUM ON L. OUTER SPACE 339 (2003). *See also* Pop, *supra* note 47, at 197.

59 Pop, *supra* note 47, at 197

60 Pop, *supra* note 47, at 197. For an enjoyable article on their entrepreneurial efforts, *see also* Barbara Plett, *Despatches: Yemenis Claim Mars*, BBC NEWS (Mar. 22, 1998), http://news.bbc.co.uk/2/hi/despatches/67814.stm (also noting source of claim derived from Himyaritic and Sabaean mythologies).

61 2004 WL 3167042 (D. Nev. 2004).

on the asteroid Eros.[62] In the suit, Mr. Nemitz requested NASA pay a parking fee for landing the NEAR spacecraft on the asteroid, which he had purchased and registered with a private "space registry" called Archimedes Institute. In April 2004, the District Court of Nevada dismissed Mr. Nemitz's claim for failure to state a cause of action, stating in part that, "neither the failure to the United States to ratify the [Moon Agreement], nor the United States'[s] ratification in 1967 of the [Outer Space Treaty], created any rights in Nemitz to appropriate private property rights on asteroids".[63] The United States Court of Appeals for the Ninth Circuit affirmed the decision of the District Court.[64]

The *Nemitz* case is also useful because it introduces a further element into our discussion – the creation of international registries for extraterrestrial proprietary claims.[65] The difference with other undertakings consists in the fact that these companies do not claim ownership of celestial bodies. Rather, their activities act as a means of recognizing the claims of those individuals claiming extraterrestrial property rights. In other words, they claim to solve the quite separate issue of allocating property rights.

B. Problems of Misinterpretation and Misallocation

Extraterrestrial real estate developers are well aware of the Outer Space Treaty and of the non-appropriation principle contained in Article II.[66] They

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62 For information on the *Nemitz* case see: W. White, *Nemitz vs. US, the First Real Property Case in United States Courts*, PROC. FORTY-SEVENTH COLLOQUIUM ON L. OF OUTER SPACE 339 (2004).

63 *Nemitz v. United States*, Order CV-N-03-0599-HDM (U.S.D.C., Nevada, 27 April 2004), http://www.erosproject.com/order01.html. Interestingly, while NASA explicitly avoided interpreting article II of the Outer Space Treaty, a letter by the Department of State's Bureau of Oceans and International Environmental and Scientific Affairs interpreted article II of the Outer Space Treaty as denying private claims to extraterrestrial real property ("We have reviewed the 'notice' dated February 13, 2003, that you sent to the US Department of State. In the view of the Department, private ownership of an asteroid is precluded by Article II of the Outer Space Treaty of 1967. Accordingly, we have concluded that your claim is without legal basis.").

64 The text of the decision is here repeated in full, taken from http://www.erosproject.com/appeal/apindex.html.:

> Gregory Nemitz appeals pro se from the district court's dismissal of his complaint for failure to state a claim in his action seeking a declaratory judgment concerning alleged private property on the asteroid 433, "EROS." We affirm for the reasons stated by the district court in its order dismissing the complaint, filed on April 26, 2004. (1)
>
> Footnote (1): Nemitz's pending motions to convene an Article III court and to file an amicus brief are denied.

65 *See Lunar Federation company*, http://lunarfederation.com/faq.htm (link now broken). For information on the Archimedes Institute, see *The Archimedes Institute*, http://www.permanent.com/ep-archi.htm.

66 *Supra* note 15.

have also developed a legal argument as to why their claims are valid, interpreting Article II as non-applicable to questions of private appropriation.[67] Lunar Embassy, for example, provides the following (questionable) legal reasoning behind its claim to own the Moon:

> [Acquiring title to extraterritorial property is] a bit like in the old west: Who stakes their claim on a piece of land first, gets the best property. This is modeled on old american [*sic*] law. Such a claim must be registered with your local Government Office for claim registries. In regard to Lunar properties, it obviously helps, if this is also done in the USA, as the Americans were the first to walk on the Moon and plant their flag on it (ie [*sic*] it could be argued, that if the Moon ever belonged to anyone, it certainly belongs more to the USA than any other nation).[68]

Hope's claims to lunar property rest on three arguments. The first argument is that lunar property is akin to *terra nullius*, and is thus free for the taking. The second argument is that registering his property with a United States agency protects his claims because the United States was the first country to land on the moon and thus, it 'belongs' to the United States. The third is that by notifying the United States government and the United Nations of his claim and having received no response, he had received the tacit approval of the authorities over his ownership of the moon.

Quite outside of the general discussion on the possibility of private ownership, it is quite easy to see the fallacy in his argumentation.[69] The second claim proves easiest to invalidate, as it follows that the United States has appropriated the Moon, an act expressly prohibited in Article II of the Outer Space Treaty.[70] Likewise, the third claim is wholly unavailing, as silence does not entail acquiescence. This leaves only the first claim, that outer space is in fact something akin to *terra nullius*. However, Hope's contentions fail

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67 *See supra*, s. II.A.

68 *See supra* note 52. Using Hope's own expression of the norms and procedure of claiming lunar territory proves useful for two reasons. First, Hope's claims demonstrate in very concrete terms the fallacies underlying current claims to extraterrestrial property. Second, they provide a firm foundation of understanding the confusion underlying interpretation of Article II.

69 For the latter, *see supra*, s. II.A.

70 Outer Space Treaty, *supra* note 3 and accompanying text.

to meet the requirements to satisfy such claims, whether in civil or international law. The requirement that a claimant actually make effective use of the property claimed has a long tradition, going back to principles of *occupatio* under Roman law.[71] In public international law, the requirement was institutionalized by requiring the claimant state to possess and administrate the affairs of the acquired territory, in what became the principle of first discovery and effective occupation.[72] In the *Island of Palmas* decision, the International Court of Justice translated this into the principle of first discovery and effective occupation.[73] In the case of the American frontier, acts designed to push frontier settlement by recognizing claims to frontier land, such as the Homestead Act, required not only a claim, but actual "settlement and cultivation".[74]

Developments in the area of extraterrestrial real estate also illustrate issues of concern in the realm of allocation and exclusion. In this respect, the *Nemitz* case is quite interesting. To be effective, a system of property rights requires not only the recognition of the capacity to hold such right, but also the ability to allocate those rights to particular individuals and to exclude other individuals from the property once allocated.[75] That no recognized regulatory mechanism exists to collect, examine and recognize potential claims to lunar property presents extreme problems in sustaining a viable property rights

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71 HENRY SUMNER MAINE, ANCIENT LAW 239 (Ashley Montagu, ed., University of Arizona Press 1986) (1861) ("The Roman principle of Occupancy, and the rules into which the jurisconsults expanded it, are the *source of all modern International Law on the subject of … the acquisition of sovereign rights in newly discovered countries.* They have also *supplied a theory of the Origin of Property*, which is as once the popular theory, and the theory which, in one form or another, is acquiesced in by the great majority of speculative jurists." [emphasis added]). In the sphere of property rights, the Roman law principle of occupation was used as a means of explaining the transformation from the state of nature to a system of property rights, a theory expressed by jurists of both the common law and civil law traditions. *Id.* at 243-48 (referencing, *inter alia*, the English jurist William Blackstone and German jurist Friedrich Carl von Savigny). *See also* SURYA P. SHARMA, TERRITORIAL ACQUISITION, DISPUTES AND INTERNATIONAL LAW 61 (1997).

72 Oppenheim succinctly summarized these requirements in his treatise on international law in the following words: "Possession (by settlement) and administration are the two essential facts that constitute an effective occupation." LASSA F.L. OPPENHEIM, INTERNATIONAL LAW: A TREATISE 555 (8th ed. 1955). *See also* SCHWARZENBERGER & BROWN, *supra* note 15, at 97 & 563.

73 *See e.g.* Island of Palmas Case, 2 U.N. Rep. Intl. Arb. Awards 829 .

74 *See e.g.* Homestead Act of 1862 (adopted during the 37th congress, session II, ch. LXXV, 1862).

75 Baca, *supra* note 21.

regime. Nemitz could not assert his claim against the United States not only because the registry maintained by the Archimedes Institute does not crystallize his rights to Eros, but also because an appropriate alternative mechanism does not exist.

The *Nemitz* case also clearly demonstrates the conflict between the exclusionary nature of private property rights and the freedom of states to explore outer space. The latter right is explicitly conveyed within the terms of Article I of the Outer Space Treaty, which grants states free access to outer space, the right to freely explore and use outer space on a non-discriminatory basis and the right to freely investigate outer space for scientific purposes.[76] Such rights also explicitly include the moon and other celestial bodies.[77] State access, however, weakens the incentives provided by a private property rights regime. While neither the government agency nor the court looked to Article I to justify its decision, either could have asserted the positive right of the United States to access and investigate the Eros asteroid for scientific purposes.

Nemitz also demonstrates a problem wholly different from legal uncertainty but no less serious – what we might call behavioral uncertainty. Behavioral uncertainty refers to the perceived position of various actors and how those perceptions influence their actions with respect to other actors. As *Nemitz* demonstrates, those who believe their claims to be valid might well act on them. Such actions can have a negative influence on business decisions quite independent of legal uncertainties.[78]

IV. BETWEEN OWNERSHIP INCENTIVES AND DISTRIBUTIONAL EQUITY: STRIKING THE BALANCE

Up to this point, this article has addressed certain normative aspects of the legal regime governing the exploitation of the moon and other celestial bodies, and has demonstrated how current claims of extraterrestrial 'real estate developers' both operate on misinterpretations of the law and present potential conflicts between a private system of property rights and the current legal

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76 Outer Space Treaty, *supra* note 3, art. I.

77 Outer Space Treaty, *supra* note 3, art. I.

78 Hertzfeld & von der Dunk, *supra* note 13, at 92.

regime governing outer space.[79] We have also discussed certain uncertainties and inefficiencies in the current regime as well as their potential effects on any space activities aimed at exploiting the resources contained on or in the moon or other celestial bodies.[80]

Ultimately, the resolution of these uncertainties and inefficiencies is tied to the distribution of the benefits received from exploiting those resources. This question has proven to be extremely difficult. In the area of space law, the debate over a regulatory framework for resources on celestial bodies has centered on this pivot between incentivizing research and development through private ownership and the need to provide for some form of redistribution between the few with technological resources to exploit those resources and the many who do not. This tension is best exemplified in both the failure of the Moon Agreement to garner any substantive form of support and the success of the ITU in creating a system to manage the GSO.

A. The Moon Agreement and WARC-ORB-88: A Common Tale with Divergent Endings

The Moon Agreement provides for the development of a regulatory framework for the exploitation of lunar resources. More specifically, Article 11(5) provides that, "States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible".[81] The regulatory framework to be established in accordance with the Agreement is to be based on the principle

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79 *See generally supra*, s. III.

80 *See generally supra*, s. II.

81 Moon Agreement, *supra* note 13, art. 11(5). The Moon Agreement treats resources in place differently than those once extracted. Moon Agreement, *supra* note 13, art. 11(3) ("Neither the surface nor the subsurface of the Moon, nor any part thereof or natural resources *in place*, shall become property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person. The placement of personnel, space vehicles, equipment, facilities, stations and installations on or below the surface of the Moon, including structures connected with its surface or subsurface, shall not create a right of ownership over the surface or the subsurface of the Moon or any areas thereof. The foregoing provisions are without prejudice to the international regime referred to in paragraph 5 of this article." [emphasis added]).

of the "common heritage of mankind".[82] Unlike the province of all mankind, the concept of common heritage of mankind has proven to be extremely controversial, calling for the recognition of a common propriety interest in a particular landscape.

The logical conclusion of such expression is found in Article 11(7)(d), requiring the equitable distribution of the benefits of exploitation amongst all nations:

> The main purposes of the international regime to be established shall include … [a]n equitable sharing by all States Parties in the benefits derived from those 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.[83]

This provision primarily represents the interests of the developing world in ensuring their ability to access such benefits, given the current technological lag. The rejection of this form of redistribution by the technological 'haves', most notably the United States, is cited as the principle reason for the failure of the Moon Agreement to develop any significant following.[84]

So far, the most developed regulatory system for a scarce resource in outer space is the regulation of space and frequency allocations in the GSO by the ITU, first agreed upon in WARC-ORB-88. The GSO refers to a particular orbit located 35.757 kilometers above the equator. In this particular location, satellites rotate around the earth in 23 hour 56 minutes and 4 seconds, a period which is synchronous with the earth's rotation on its axis, a feature which fixes the object relative to a particular point on the earth's surface. A satellite placed in the GSO can continuously cover a particular area measuring

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82 Moon Agreement, *supra* note 13, art. 11(1).

83 Moon Agreement, *supra* note 13, art. 11(7)(d).

84 Indeed, ratification of the Moon Agreement has sometimes negatively affected a state with respect to its involvement in the United States space program. Most notably, Australia's ratification of the Moon Agreement caused significant concern for the United States when considering whether to conclude a treaty with Australia for locating an emergency landing facility for its shuttles.

approximately one third of the earth's surface. Thus, a service provider can provide almost global coverage with just three satellites. This fact makes the GSO particularly valuable for telecommunications, meteorological and other service providers.

Several characteristics particular to the GSO have also required the regulation of its use. These relate both to the position of the satellites within orbit and the frequencies at which those satellites transmit signals. Because the GSO is relative to a particular position on and distance from the earth, the number of positions in the orbit, called orbital slots, are limited. It has been estimated that the GSO could accommodate roughly 1800 satellites, each located 0.2° from each other, without facing the risk of collision or interference. Currently, the number of satellites is far from this figure and thus the risk of collision among satellites in the GSO is relatively low. The more imperative problem relates to the possibility of radio frequency interference between systems. If two different transmissions are made in the same geographic area at the same frequency, they will interfere with each other, leading to loss or deterioration of the signal. The distance required to operate the same frequency without interference is much greater than the 0.2° between slots. Failure to properly coordinate frequencies has resulted in real problems.[85] As a consequence of these impediments, the geostationary orbit is considered to be a limited natural resource.

The regulatory regime which has been developed from issues related to the GSO provides a second example of, this time a successful, balancing the issues of incentivizing development and innovation through the acquisition of a proprietary interest in the use of the orbital slot and frequency and the need to ensure an equitable distribution of benefits between those with present access and those without. Again, the debate was highly polarized. Those who could access the GSO preferred the incumbent 'first-come, first-served' principle on which the system of allocation operated. The developing countries

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85 *See* K.U. Schrogl, *Question relating to the character and utilization of the geostationary orbit*, *in* INTERNATIONAL SPACE LAW IN THE MAKING: CURRENT ISSUES IN THE UNITED NATIONS CONVENTIONS ON THE PEACEFUL USES OF OUTER SPACE 151 (K.U. Schrogle & M. Benkö eds., 1993); R.S. Jakhu, *The legal issues of the geostationary orbit* 7 ANNALS AIR & SPACE L. 333 (1982).

advocated a system of *a priori* distribution to ensure access.[86] After nearly two decades of disagreement, the WARC-ORB-88 modified the 'first-come, first-served' principle to provide more equitable access to developing countries.[87] While recognizing the allocations created under the old system, a new system of allocation provided each country with a nominal allotment in terms of both space and frequency.[88] The provisions of WARC-ORB-88, regulating property in terms of usufruct, generally comport with space law.

B. Going Forward: Some Suggestions and Considerations

The success of the ITU's WARC-ORB-88, when compared with the failure of the Moon Agreement to garner any significant form of support, suggests the need for a more flexible approach to the issue of incentivizing rapprochement and the value of compromise. Compromise has many advantages in terms of increasing the legitimacy of the outcome reached and, thus, of ensuring compliance while achieving the substantive goals of technological progress and distributional equity. A comparison of the relative

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86 *See* Baca, *supra* note 21, at 1079 ("The developed nations preferred the flexibility of the old process based on case-by-case coordination and first-come, first-served priority. … On the other hand, the developing nations favored a rigid *a priori* plan that would guarantee access in the future. The developed nations, while optimistic that all nations may be accommodated in the orbit, feared that the *a priori* planning approach would promote rigid technical specifications and remove incentives for technical innovation. The result of such a plan could be an artificial scarcity in orbit positions and inefficient and inequitable use of the resource in general."). *See also* Milton Smith, *A New Era for the International Regulation of Satellite Communications*, XIV ANN. AIR & SP. L. 449, 450 (1989) (noting that "[m]oreover, the concerns of developing countries regarding their future access to the orbit/spectrum resource were understandable in light of the increasingly intensive use being made of that resource by developed countries. Although developed countries contended that advancing technology provides a guarantee for future access, developing countries had a general distrust of solutions based on technology since advanced technologies are often not affordable for them." Smith, a legal advisor to the US WARC-ORB-88 delegation, goes on to develop the developed countries' position, already described in Baca, *supra* note 21, at 1079.).

87 For an analysis of the WARC 88 and of its main innovation see: C.Q. Christol, *The legal status of the geostationary orbit in the light of the 1985-1988 activities of the ITU*, PROC. THIRTY-SECOND COLLOQUIUM ON L. OF OUTER SPACE 215 (1989); S. Ospina, *The ITU and WARC_ORB: will the revised radio regulations result in a sui-generis legal regime for the GSO?*, PROC. THIRTY-SECOND COLLOQUIUM ON L. OF OUTER SPACE 247 (1989); T. Lozanova, *Legal status of the geostationary orbit in the light of the recent activities of ITU*, PROC. THIRTY-SECOND COLLOQUIUM ON L. OF OUTER SPACE 233 (1989).

88 Smith, *supra* note 86, at 455-56.

success and failure of the two regimes yields some potentially important considerations when addressing a future regime for exploitative activities on the Moon or other celestial body.

Perhaps most obvious is the role actual technological capabilities played in influencing position. Compromise was most certainly a more pressing issue in the case of the GSO in the 1970s and 1980s than current concerns of overuse of limited lunar resources. In the case of the GSO, satellite technology was both present and increasingly used by a select number of advanced countries. In the Bogota Declaration of 1976,[89] a number of developing countries along the equator attempted to exclude the GSO from the definition of outer space in order to assert control over the resource. Moreover, the agenda set for WARC-ORB-88 was perceived as a last chance to achieve a solution eight years in the making.[90] Failure, therefore, would have been a much more tangible loss in the case of the GSO, as compared to the general air of noncommittal in the case of exploitation on the moon.

A comparison of the two regimes also highlights some interesting conclusions relating to the role institutions play in the structure of a negotiated compromise. Specifically, the case of WARC-ORB-88 suggests the value of having a credible, existing regulatory organization in reaching a negotiated solution. Where such an organization exists, strong levels of delegation and agreement to be bound to commitments undertaken can make up for vague expressions as to the scope of commitment.[91] Indeed, a relatively low level of precision in language may prove more effective in institution-building than caging the institution within a set of precisely-framed competences.[92] In the case of WARC-ORB-88, the availability of the ITU, an international

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89 Declaration of the First Meeting of Equatorial Countries, Dec. 3, 1976. The Declaration has been reproduced in 6 J. SPACE L. 193 (1978).

90 Smith, *supra* note 86, at 452. ("The knowledge that no additional session was scheduled to resolve matters, if this session proved unsuccessful, mandated a business-like approach without resorting to extraneous political issues.").

91 This is a central argument of the legalization literature. *See e.g.* Kenneth W. Abbott et al., *The Concept of Legalization* 54(3) INT'L ORG. 401, 405-06 (2000). (discussing the Sherman Act, the EEC competition law provisions, and the 1987 Montreal Protocol on Subtances that Deplete the Ozone).

92 *Id.* (noting the favorability of the vague provisions in the Sherman and EC Treaty).

organization with a historical record of fairness and effectiveness, was of critical importance in terms of both setting the agenda for compromise and providing an institutional framework to which states could delegate monitoring and compliance tasks. In contrast, the Moon Agreement committed states to a vaguely described third party organization while making explicit and precise commitments as to the distribution of any benefit derived from a particular state's activities. The high level of precision in the commitments undertaken in the Moon Agreement is a prime example of too much too soon.

V. CONCLUSION

While this article has addressed a number of themes, analysis has converged on two points. First, it has evaluated the present legal regime and articulated specific problems to the further development of commercial space in the area of the exploitation of resources on the Moon and other celestial bodies. Such issues have focused on the creation of legal certainty to incentivize the research and development of space technology and on the legal means of incentivizing sustainability in exploiting such resources. Second, the article has demonstrated that in order to achieve the goals of certainty and sustainability, state parties will have to address the issues related to the distribution of the benefits of such activities. In this regard, the Moon Agreement and WARC-ORB-88 have provided some initial means of exploring possible structures. The failure of one and the success of the other further suggest a path towards an acceptable regulatory regime for the exploitation of the moon and other celestial bodies.