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## Markets, Regulation, and Inevitability: The Case for Property Rights in Outer Space

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**MARKETS, REGULATION, AND INEVITABILITY: THE CASE FOR  
PROPERTY RIGHTS IN OUTER SPACE**

*Eliot T. Tracz\**

ABSTRACT

*In 1967, a number of countries – including the United States – entered into the Outer Space Treaty. This treaty established the fundamental rules by which countries are to conduct themselves in outer space. At the time, there was more concern about the possibility of the Cold War, and thus nuclear weaponry, extending into space and very little consideration of commercial activity, which was largely the province of Science Fiction. Today, commercialization of space includes satellites, private companies contracting for government work, space tourism, and the early stages of testing materials for resource extraction. Interestingly, no international system for the recognition of property rights exists in relation to outer space resources. With the new Artemis space program underway- and its acknowledged intent to lay the groundwork resource extraction- now is the time consider property rights.*

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## INTRODUCTION

On November 16, 2022, the National Aeronautics and Space Administration (NASA) launched the Artemis 1 spacecraft.<sup>1</sup> For the first time since Apollo 17 landed in 1972, NASA plans to place astronauts on the moon. The Artemis program promises new opportunities for discovery, including the search for water<sup>2</sup> as well as the planned building of a Lunar Gateway station.<sup>3</sup>

<sup>1</sup> Jackie Wattles & Ashley Strickland, *Artemis I mission shares spectacular view of Earth after a historic launch*, CNN (Nov. 17, 2022, 9:54 AM), <https://www.cnn.com/2022/11/16/world/artemis-1-launch-nasa-scen/index.html>.

<sup>2</sup> Meghan Bartels, *Moon VIPER: NASA Wants to Send a Water-Sniffing Rover to the Lunar South Pole in 2022*, SPACE (Oct. 16, 2019), <https://www.space.com/viper-nasa-moon-rover.html>.

<sup>3</sup> Hanneke Weitering, *NASA Has a Full Plate of Lunar Missions Before Astronauts Can Return to Moon*, SPACE (May 23, 2019), <https://www.space.com/nasa-moon-missions-before-2024.html>.

But the Artemis program promises more than just a renewal of scientific interest in the moon. The Artemis program was preceded by the Artemis Accords, which, on October 13, 2020, were signed by the United States and representatives from Australia, Canada, Italy, Japan, Luxembourg, the United Arab Emirates, and the United Kingdom.<sup>4</sup> A non-binding “political commitment”, the Artemis Accords explicitly contemplate the exploitation of natural resources.<sup>5</sup> Since their initial signing, the Artemis Accords have added additional signatories.<sup>6</sup>

While space law and policy undergo change at the international level, private industry has also made inroads to space commercialization. Blue Origin, founded by Jeff Bezos, has made a name for itself by ferrying high-paying tourists into the nearest reaches of space.<sup>7</sup> At the same time, SpaceX continues to make news with its commercial activities.<sup>8</sup> Both companies have become involved in the Artemis Project.<sup>9</sup>

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<sup>4</sup> The Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids For Peaceful Purposes, Oct. 13, 2020, <https://www.nasa.gov/specials/artemis-accords/img/Artemis-Accords-signed-13Oct2020.pdf> [hereinafter Artemis Accords].

<sup>5</sup> *Id.*; see also Jack Wright Nelson, *The Artemis Accords and the Future of International Space Law*, AM. SOC'Y INT'L L. (2020).

<sup>6</sup> There are currently twenty-one signatories. See Jeff Foust, *Artemis Accords signatories hold first meeting*, SPACENEWS (Sept. 21, 2022), <https://spacenews.com/artemis-accords-signatories-hold-first-meeting/#:~:text=Representatives%20from%20the%202021%20countries,the%20International%20Astronautical%20Congress%20here>.

<sup>7</sup> William Harwood, *Blue Origin launches six passengers on supersonic flight to the edge of space*, CBS NEWS (Aug. 4, 2022, 12:23 PM), <https://www.cbsnews.com/news/blue-origin-launches-six-passengers-on-supersonic-flight-to-the-edge-of-space>.

<sup>8</sup> *SpaceX satellite launch lights up night sky*, USA TODAY (Aug. 28, 2022, 10:46 AM), <https://www.usatoday.com/videos/news/nation/2022/08/28/spacex-satellite-launch-lights-up-night-sky/7925004001>.

<sup>9</sup> See Stephen Clark, *Blue Origin wins lion's share of NASA funding for human-rated lunar lander*, SPACEFLIGHT NOW (Apr. 30, 2020), <https://spaceflightnow.com/2020/04/30/blue-origin-wins-lions-share-of-nasa-funding-for-human-rated-lunar-lander>; Loren Grush, *NASA partners with SpaceX, Blue Origin, and more to send large payloads to the Moon*, THE VERGE (Nov. 18, 2019, 6:07 PM), <https://www.theverge.com/2019/11/18/20971307/nasa-clps-program-spacex-blue-origin-sierra-nevada-eres-tyvak-viper-rover>.

As private companies expand their ability to operate in outer space, the range of possible commercial activities for those parties to engage in has increased as well. Perhaps the most prominent of those commercial activities is the exploitation of outer space resources. Once the province of science fiction, mining has fast become a viable option for entrepreneurial businesses seeking to operate in space.<sup>10</sup> The moon, given its proximity, is of particular interest.<sup>11</sup>

Where there is a demand for a commodity, a market is sure to appear. But a market—a “place designated for selling things”<sup>12</sup>—requires certain things to be efficient. One of those necessities is a system for recognizing private property. Property, at the most basic level, “concerns legal relations among people regarding control and disposition of valued resources.”<sup>13</sup> Rights, rather than things, are what we understand as property. Usually, we understand these rights as a “bundle of sticks” with the “sticks” including rights such as: the right to possess, the right to use and enjoy, the right to transfer, and the right to be immune from having property taken or damaged without consent.<sup>14</sup> Markets, then, facilitate the transfer of these bundles of sticks between parties.

So, what happens when a market arises without any defined system of property rights? Can sellers sell something that they have possession over but not title? Can buyers purchase a commodity from someone who has no right to transfer ownership of that commodity? These are some of the questions facing spacefaring nations, intergovernmental agencies, and consumers as the commercialization of space becomes more attainable.

The ultimate thesis of this Article is that commercialization of space resources is inevitable, and therefore the need for a system of property rights is growing urgent. Recent actions such as the SPACE Act and the Artemis Accords have signaled a deep commitment by the

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<sup>10</sup> Sarah Lewin, *Asteroid Mining Company's 1st Satellite Launches from Space Station*, SPACE (July 17, 2015), <https://www.space.com/29975-asteroid-mining-planetary-resources-satellite-launch.html>.

<sup>11</sup> Leonard David, *Moon Mining Could Actually Work, with the Right Approach*, SPACE (Mar. 15, 2019), <https://www.space.com/moon-mining-space-exploration-report.html>.

<sup>12</sup> *Market*, BALLENTINE'S LEGAL DICTIONARY AND THESAURUS (1995).

<sup>13</sup> JOSEPH WILLIAM SINGER, PROPERTY 2 (4th ed. 2014).

<sup>14</sup> JOSEPH WILLIAM SINGER ET AL., PROPERTY xxxii (8th ed. 2022).

United States to engage in the exploitation of outer space resources, regardless of the views of other nations.

Section I addresses legal questions surrounding the exploitation of resources in outer space.<sup>15</sup> This begins with a discussion of the core treaties governing outer space: the Outer Space Treaty, the Liability Convention, and the Registration Convention.<sup>16</sup> It addresses the ongoing debate regarding the role – and desirability – of property rights in outer space.<sup>17</sup> Finally, it addresses the ways in which private property rights are already acknowledged to exist in outer space.<sup>18</sup>

Section II discusses arguments for and against property rights in outer space.<sup>19</sup> First, it reviews arguments against property rights, which are largely based on the text of the Outer Space Treaty. Next, it considers the role of property rights in regulating common pool resources, applying game theory in a space-based context.<sup>20</sup> It continues on to address how the creation of a regime of property rights is necessary to facilitate functional markets.<sup>21</sup> Finally, it argues that commercialization of space is inevitable, and that, as a result, now is the time to proactively set the rules for space resource extraction.<sup>22</sup>

Section III discusses which property rights should form the minimum allotment of rights for a market to function.<sup>23</sup> It begins by arguing that there should be three essential rights including: (1) the right to possess celestial bodies for the purpose of resource exploitation, (2) the temporary right to exclude others from celestial bodies while extraction is occurring, and (3) the right to transfer ownership of those resources.<sup>24</sup> Finally, it argues that these essential rights provide a framework around which to begin creating viable markets for outer space resources.<sup>25</sup>

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<sup>15</sup> See *infra* Section I.

<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

<sup>18</sup> *Id.*

<sup>19</sup> See *infra* Section II.

<sup>20</sup> *Id.*

<sup>21</sup> *Id.*

<sup>22</sup> *Id.*

<sup>23</sup> See *infra* Section III.

<sup>24</sup> *Id.*

<sup>25</sup> FRANCIS LYALL & PAUL B. LARSEN, SPACE LAW: A TREATISE 459 (2d ed. 2018).

I. OUTER SPACE LAW AND PRIVATE PROPERTY

A. The Core Treaties

1. *The Outer Space Treaty*

In 1967, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty) took effect.<sup>26</sup> The first major agreement involving outer space law, the Outer Space Treaty is both the most widely ratified and most widely recognized of the space treaties.<sup>27</sup> The Outer Space Treaty in general, and Articles I and II in particular, are regarded as “essentially determining the legal status of outer space as a global commons and the resulting baseline freedom of activity there.”<sup>28</sup> In addition, Articles III through VIII further expand upon the role of international law and State jurisdiction.<sup>29</sup> Articles IV, X, and XI discuss the militarization of space.<sup>30</sup>

The Outer Space Treaty was adopted by the General Assembly of the United Nations on December 19, 1966 and opened for signature on January 27, 1967.<sup>31</sup> “Inspired” as the preamble states, “by the great prospects opening up before mankind as a result of man’s entry into outer space,” the Outer Space Treaty recognizes the common interest of humankind in the exploration of space, while also manifesting a belief that cooperation between states would contribute to the development of mutual understanding and strengthening friendly relationships between the states parties to the treaty.<sup>32</sup> What made the Outer Space Treaty brilliant was that it took a number of pre-existing but non-binding ideas and agreements regarding space law and

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<sup>26</sup> 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, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

<sup>27</sup> FRANS G. VON DER DUNK, *ADVANCED INTRODUCTION TO SPACE LAW* 16 (2020).

<sup>28</sup> *Id.* at 16-17.

<sup>29</sup> *See* Outer Space Treaty, *supra* note 26, art. III-VIII.

<sup>30</sup> *Id.* art. IV, X-XI.

<sup>31</sup> LYALL & LARSEN, *supra* note 25, at 49.

<sup>32</sup> Outer Space Treaty, *supra* note 26, Preamble.

turned them into law through treaty, in the process addressing the issues of non-compliance which had plagued earlier agreements.<sup>33</sup>

In practice, the Outer Space Treaty has come to be regarded as a foundation for outer space law.<sup>34</sup> Articles I through III articulate the fundamental principles agreed to by the signatories to the treaty.<sup>35</sup>

Article I of the Outer Space Treaty states the majority of the foundational principles of outer space law. The article reads in its entirety:

The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind. Outer Space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies. There shall be freedom of scientific investigation in outer space, including the moon and other celestial bodies, and States shall facilitate and encourage international co-operation in such investigation.<sup>36</sup>

In three short paragraphs, a number of important principles are presented. First, Article I, with its declaration that space, the moon, and other celestial bodies “shall be the province of all mankind”<sup>37</sup> sets out a clear statement of intent to apply the common heritage principle. The phrase “cultural heritage of all mankind” first appeared in the preamble to the Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict.<sup>38</sup> Conceptually, common

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<sup>33</sup> LYALL & LARSEN, *supra* note 25, at 50.

<sup>34</sup> *Id.* at 50-51.

<sup>35</sup> *Id.* at 54.

<sup>36</sup> Outer Space Treaty, *supra* note 26, art. I.

<sup>37</sup> *Id.*

<sup>38</sup> Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict With Regulations for the Execution of the Convention pmb., *opened for signature* May 14, 1954, 249 U.N.T.S. 215 (entered into force Aug. 7, 1956).



heritage has existed for centuries. Philosopher Immanuel Kant wrote that “use of the right to the *earth’s surface*, which belongs to the human race in common” should effectively “bring the human race ever closer to a cosmopolitan constitution.”<sup>39</sup>

Despite invoking the common heritage principle, the Outer Space Treaty does not convey precisely what is meant by “province of all mankind.” Indeed, there is no universally agreed upon definition of the common heritage principle. At least one author has attempted a definition, finding five core elements.<sup>40</sup> The first of those elements is non-appropriation, which requires that the common heritage region cannot be subject to either public or private appropriation.<sup>41</sup> Second, there must be common management, which means that all resources must be managed by representatives from all States.<sup>42</sup> Third, there must be benefits sharing between all nations involved in exploiting resources in common heritage regions and all other nations.<sup>43</sup> Fourth, the common heritage region must be used for peaceful means.<sup>44</sup> Finally, the common heritage region must be used in such a manner that it will be preserved for future generations and not subjected to rapid depletion.<sup>45</sup> All of these factors seem consistent with the spirit of the Outer Space Treaty.

The second principle articulated by Article I is that space shall be free for exploration and use by all States.<sup>46</sup> Closely tied to the principle of freedom of exploration is the third principle: freedom of access to all areas of celestial bodies.<sup>47</sup> While not explicitly stated, this implies an acknowledgment that there is no right to exclude in outer space.

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<sup>39</sup> Immanuel Kant, *Toward Perpetual Peace*, in PRACTICAL PHILOSOPHY 311, 329 (Mary J. Gregor ed., 1996).

<sup>40</sup> Jennifer Frakes, Comment, *The Common Heritage of Mankind Principle and the Deep Seabed, Outer Space, and Antarctica: Will Developed and Developing Nations Reach a Compromise?*, 21 WIS. INT’L L. J. 409, 411 (2003).

<sup>41</sup> *Id.* at 411.

<sup>42</sup> *Id.* at 412.

<sup>43</sup> *Id.*

<sup>44</sup> *Id.* at 413.

<sup>45</sup> *Id.*

<sup>46</sup> Outer Space Treaty, *supra* note 26, art. I.

<sup>47</sup> *Id.*

The fourth principle found in Article I is the freedom of scientific investigation in outer space.<sup>48</sup> This freedom extends to the Moon as well as all other celestial bodies.<sup>49</sup> Furthermore, States party to the Outer Space Treaty are required to “facilitate and encourage international co-operation in such investigation.”<sup>50</sup> The result is the expectation that scientific activities in outer space will be collaborative rather than competitive.

Article II of the Outer Space Treaty deals with state sovereignty. It reads, “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.”<sup>51</sup> This effectively bars States party to the Outer Space Treaty from claiming any part of outer space through any means. “Occupation” used in this sense is a term of art in international law which “involves both ‘being there’ and the intention to act as sovereign in relation to the occupied location.”<sup>52</sup>

Article III, the final article relevant to this discussion, discusses the relevance of international law in outer space. It reads:

States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding.<sup>53</sup>

This Article, particularly the reference to the Charter of the United Nations, draws attention to one of the major events driving the creation of the Outer Space Treaty – the Cold War.<sup>54</sup> Indeed, a reading of the Outer Space Treaty shows that – from principle concepts of

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<sup>48</sup> *Id.* art. II.

<sup>49</sup> *Id.*

<sup>50</sup> *Id.*

<sup>51</sup> *Id.* art. II.

<sup>52</sup> LYALL & LARSEN, *supra* note 25, at 55.

<sup>53</sup> Outer Space Treaty, *supra* note 26, art. III.

<sup>54</sup> VON DER DUNK, *supra* note 27, at 19.

mutual assistance to the ban on nuclear weapons in space – the Cold War weighed heavily on the minds of the Signatories.

## 2. *The Moon Agreement*

The second important international document governing outer space is the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (the Moon Agreement).<sup>55</sup> Signed in 1979, the Moon Agreement explicitly declares that the Moon and its natural resources are the common heritage of mankind.<sup>56</sup> Furthermore, the Moon Agreement states that:

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.<sup>57</sup>

The Moon Agreement also requires the State Parties to create an international regime to govern the exploitation of the natural resources of the Moon.<sup>58</sup>

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<sup>55</sup> Agreement Concerning the Activities of States on the Moon and Other Celestial Bodies, *opened for signature* Dec. 18, 1979, 1363 U.N.T.S. 3 (entered into force July 11, 1984) (not in force for the United States) [hereinafter Moon Agreement].

<sup>56</sup> *Id.* art. XI.

<sup>57</sup> *Id.* art. XI, cl. 3.

<sup>58</sup> *Id.* art. XI, cl. 4.

This strong stance on the Moon as the common heritage of mankind may be the reason that the Moon Agreement has been largely unsuccessful. None of the States capable of launching manned space missions have signed on to the Moon Agreement, rendering it ineffective at governing the commercial actions of those entities most likely to engage in exploitation of outer space resources.<sup>59</sup> Despite the fact that the Moon Agreement has been largely ignored, it is still invoked from time to time in discussions of outer space property rights.<sup>60</sup>

The continued reference to the Moon Agreement makes it relevant to any discussion of outer space resources. It is unlikely, however, that the Moon Agreement will be a major policy player in any decisions regarding the creation of property rights in outer space resources.

### 3. *The Liability Convention*

The Convention on International Liability for Damage Caused by Space Objects (Liability Convention) was opened for signature in 1972.<sup>61</sup> Taking into account the Outer Space Treaty, and acknowledging the precautionary measures taken by States and international organizations engaged in launching objects into space, the Liability Convention sought to establish a set of rules governing liability caused by space objects.<sup>62</sup> Under this Convention there is a State-centric third-party liability scheme for damages caused by space objects.<sup>63</sup>

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<sup>59</sup> See Moon Agreement, *supra* note 55.

<sup>60</sup> See, e.g., Dennis C. O'Brien, *Beyond UNISPACE: It's time for the Moon Treaty*, SPACE REV. (Jan. 21, 2019), <https://www.thespacereview.com/article/3642/1>; Gbenga Oduntan, *Who Owns Space? US Asteroid-Mining Act Is Dangerous And Potentially Illegal*, IFLSCIENCE (Nov. 26, 2015, 10:17 AM), <https://www.iflscience.com/who-owns-space-us-asteroid-mining-act-dangerous-and-potentially-illegal-32310>.

<sup>61</sup> Convention on International Liability for Damage Caused by Space Objects, *opened for signature* Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 (entered into force Sept. 1, 1972; for the U.S., Oct. 9, 1973) [hereinafter *Liability Convention*].

<sup>62</sup> *Id.*

<sup>63</sup> VON DER DUNK, *supra* note 27, at 5.

Article II creates a strict liability framework for any damage occurring on the surface of the Earth or to an aircraft in flight.<sup>64</sup> If damage occurs somewhere other than the surface of the Earth, the regime becomes one of fault-based liability.<sup>65</sup> In instances where two or more States jointly launch a space object, they are jointly and severally liable for any damages caused by the object.<sup>66</sup>

Finally, it should be noted that the term “space object” is defined as “component parts of a space object as well as its launch vehicle and parts thereof.”<sup>67</sup> Debris caused by activities such as mining is not included in the definition. This means that the Liability Convention will need to be amended in order to keep pace with the commercialization of space.

#### 4. *The Registration Convention*

In 1976, the Convention on Registration of Objects Launched into Outer Space (Registration Convention) entered into force.<sup>68</sup> While the Outer Space Treaty already required State’s party to the treaty to register objects launched into space, the Registration Convention set out a process for doing so.<sup>69</sup> Professor Frans von der Dunk has identified a two-pronged process by which this is done.<sup>70</sup>

First, the Registration Convention requires that the “launching state” – that is the State responsible for launching an object into space – register the space object in the appropriate national register.<sup>71</sup> While it is possible for more than one State to be the “launching state”, parties involved in a joint venture are required to identify one State as the State on whose Register the space object is to be listed.<sup>72</sup>

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<sup>64</sup> Liability Convention, *supra* note 61, art. II.

<sup>65</sup> *Id.* art. III.

<sup>66</sup> *Id.* art. IV.

<sup>67</sup> *Id.* art. I(d).

<sup>68</sup> Convention on Registration of Objects Launched into Outer Space, *opened for signature* Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 (entered into force Sept. 15, 1976) [hereinafter Registration Convention].

<sup>69</sup> VON DER DUNK, *supra* note 27, at 33.

<sup>70</sup> *Id.*

<sup>71</sup> Registration Convention, *supra* note 68, art. II(1).

<sup>72</sup> *Id.* art. II(2).

Second, the Registration Convention lists the information which must be provided to the international register maintained by the United Nations Office of Outer Space Affairs (UNOOSA). This information includes: (1) the name of the launching State or States; (2) an appropriate designator or registration number for the space object; (3) the date and territory or location of the launch; (4) basic orbital information including (i) the nodal period, (ii) inclination, (iii) apogee, and (iv) perigee; and (5) a description of the general function of the space object.<sup>73</sup> The UNOOSA register may act as a de facto register for non-governmental agencies operating in outer space.<sup>74</sup>

Unfortunately, compliance with the Registration Convention has been limited.<sup>75</sup> At the same time, the number of adherents has been rising,<sup>76</sup> increasing the relevance of this particular regulatory regime. Notably, the major spacefaring States are almost all in compliance with the Registration Convention, making it an important piece of the constellation of space regulatory schemes.

## B. United States Space Policy

### 1. *The SPACE Act*

In 2015, President Obama signed the U.S. Commercial Space Launch Competitiveness Act (SPACE Act).<sup>77</sup> As suggested by the name, the SPACE Act constituted an aggressive move to commercialize outer space.<sup>78</sup> One key section of the SPACE Act, Section 51303, which bears the title “Asteroid Resource and Space Resource Rights,” is designed to encourage the expansion of space

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<sup>73</sup> *Id.* art. IV(1). (Under Article. IV(2), additional information may be added for objects being launched. This is contrasted by Article IV(3) which requires that information be registered “to the greatest extent feasible and as soon as practicable” for objects which have, for one reason or another, deorbited.)

<sup>74</sup> *Id.* art. VII.

<sup>75</sup> VON DER DUNK, *supra* note 27, at 35.

<sup>76</sup> *Id.*

<sup>77</sup> U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, 129 Stat. 704 [hereinafter SPACE Act].

<sup>78</sup> Justin Rostoff, “Asteroids for Sale”: *Private Property Rights in Outer Space, and the SPACE Act of 2015*, 51 NEW ENG. L. REV. 373, 383 (2017).

commercialization by granting property rights to private actors.<sup>79</sup> Section 51303 reads:

A United States Citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource obtained in accordance with applicable law, including the international obligations of the United States.<sup>80</sup>

This section has been the cause of some controversy.

More than one writer has argued that the SPACE Act is fundamentally incompatible with the Outer Space Treaty.<sup>81</sup> Whether the SPACE Act truly is a violation of the Outer Space Treaty is outside of the scope of this Article, but it is important to note that the SPACE Act does not grant ownership of asteroids or other celestial bodies.<sup>82</sup> Instead, the rights are granted to any “asteroid resource or space resource obtained.”<sup>83</sup> The use of the word “obtained” is significant in interpreting Section 51303 of the SPACE Act because obtain means to “come into possession of; get, acquire, or procure [something].”<sup>84</sup>

On April 6, 2020, Donald Trump signed Executive Order 13914, titled “Encouraging International Support for the Recovery of Space Resources,”<sup>85</sup> further extending the commitment of the United States to engage in Outer Space Commerce. In this Executive Order, the Trump Administration asserted that “Americans should have the right to engage in commercial exploration, recovery, and use of

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<sup>79</sup> SPACE Act, *supra* note 77, § 51303.

<sup>80</sup> *Id.*

<sup>81</sup> See, e.g., Rostoff, *supra* note 78, at 384-91; Hunter Sutherland, *The Stakes Are Out of This World: How to Fix the SPACE Act of 2015*, 22 VT. J. ENV'T L. 100, 115-21 (2021).

<sup>82</sup> SPACE Act, *supra* note 77, § 51303.

<sup>83</sup> *Id.*

<sup>84</sup> Obtain, COLLINS DICTIONARIES, <https://www.collinsdictionary.com/us/dictionary/english/obtain>.

<sup>85</sup> Exec. Order No. 13914, 85 Fed. Reg. 20,381, *reprinted as amended in* 3 U.S.C. § 301 app. at 332-33 (2021).

resources in outer space, consistent with applicable law.”<sup>86</sup> Going further, the Executive order states that the United States does not view space as a global commons.<sup>87</sup> This position may set the United States at odds with other members of the global community.

Section 2 of the Executive Order explicitly rejects the Moon Agreement. In doing so it states:

The United States is not a party to the Moon Agreement. Further, the United States does not consider the Moon Agreement to be an effective or necessary instrument to guide nation states regarding the promotion of commercial participation in the long-term exploration, scientific discovery, and use of the Moon, Mars, or other celestial bodies. Accordingly, the Secretary of State shall object to any attempt by any other state or international organization to treat the Moon Agreement as reflecting or otherwise expressing customary international law.<sup>88</sup>

This position further weakens an already weak Moon Agreement, while potentially signaling to private entities interested in exploitation of outer space resources that the United States is a friendly location from which to conduct business.

The remainder of the Executive Order sets out specific tasks and general provisions. Section 3 requires the Secretary of State to take all appropriate actions to “encourage international support for the public and private recovery and use of resources in outer space.”<sup>89</sup> In doing so, the Secretary of State is to be assisted by the Secretary of Commerce, the Secretary of Transportation, the Administrator of NASA, and any other executive department or agency which the Secretary of State deems appropriate.<sup>90</sup> Section 4 requires the Secretary of State to provide a report to the President of all activities taken under

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<sup>86</sup> *Id.* at 333.

<sup>87</sup> *Id.*

<sup>88</sup> *Id.*

<sup>89</sup> *Id.* §3.

<sup>90</sup> *Id.*



Section 3.<sup>91</sup> This report was to be delivered within 180 days after the date of the Executive Order.<sup>92</sup> Finally, Section 5 provides several general provisions related to the administration of the Executive Order.<sup>93</sup>

## 2. *The Artemis Accords*

On October 13, 2020, nine nations, including the United States, signed the Artemis Accords.<sup>94</sup> These Accords, promoted, drafted, and initiated by the United States, are intended to bring about a new era of exploration by inspiring “current and future generations to explore the Moon, Mars, and beyond.”<sup>95</sup> In doing so, the Artemis Accords commit to landing the first woman on the Moon.<sup>96</sup>

Despite affirming the importance of compliance with the Outer Space Treaty,<sup>97</sup> it could be fairly argued that the Artemis Accords merely pay lip service to treaty obligations. Some examples of this include the statement: “The Accords represent a political commitment to the principles described herein, many of which provide for operational implementation of important obligations contained in the Outer Space Treaty and other instruments.”<sup>98</sup> Elsewhere, the Artemis Accords include an agreement to share scientific information resulting from outer space activities in accordance with Article XI of the Outer Space Treaty.<sup>99</sup>

Compliance with the Outer Space Treaty only goes so far. One of the most important features of the Outer Space Treaty is its declaration that space is the common interest of mankind,<sup>100</sup> yet the Artemis Accords seek to redefine “outer space heritage” to mean nothing more than “historically significant human or robotic landing sites, artifacts, spacecraft, and other evidence of activity on celestial

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<sup>91</sup> *Id.* §4.

<sup>92</sup> *Id.*

<sup>93</sup> *Id.* §5.

<sup>94</sup> Artemis Accords, *supra* note 4, at 7.

<sup>95</sup> *Id.* at 1.

<sup>96</sup> *Id.*

<sup>97</sup> *Id.*

<sup>98</sup> Artemis Accords, *supra* note 4, §1.

<sup>99</sup> *Id.* §7.

<sup>100</sup> Outer Space Treaty, *supra* note 26, art. I.

bodies in accordance with mutually developed standards and practices.”<sup>101</sup> Although this language is seemingly at odds with the Outer Space Treaty, it is consistent with the Trump Executive order’s rejection of space as a global commons.

Sections 10 of the Artemis Accords takes a decidedly commercial turn. While claiming that space resources can benefit humankind by providing “critical support for safe and sustainable operations,” it is never made clear how that might occur.<sup>102</sup> What is clear is that the nations involved in the Artemis Accords believe that the extraction of outer space resources does not constitute national appropriation under Article II of the Outer Space Treaty.<sup>103</sup> Even so, the Artemis Accords state that all resource extraction should be done in a manner that complies with the Outer Space Treaty.<sup>104</sup>

The section of the Artemis Accords most at odds with the Outer Space Treaty is Section 11. Using vague language, this section states:

In order to implement their obligations under the Outer Space Treaty, the Signatories intend to provide notification of their activities and commit to coordinating with any relevant actor to avoid harmful interference. The area wherein this notification and coordination will be implemented to avoid harmful interference is referred to as a ‘safety zone’. A safety zone should be the area in which nominal operations of a relevant activity or an anomalous event could reasonably cause harmful interference. The Signatories intend to observe the following principles related to safety zones:

- (a) The size and scope of the safety zone, as well as the notice and coordination, should reflect the nature of the operations being conducted and the environment that such operations are conducted in;

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<sup>101</sup> Artemis Accords, *supra* note 4, §9, cl. 1.

<sup>102</sup> *Id.* §10, cl. 1.

<sup>103</sup> *Id.* §10, cl. 2.

<sup>104</sup> *Id.*

- (b) The size and scope of the safety zone should be determined in a reasonable manner leveraging commonly accepted scientific and engineering principles;
- (c) The nature and existence of safety zones is expected to change over time reflecting the status of the relevant operation. If the nature of an operation changes, the operating Signatory should alter the size and scope of the corresponding safety zone as appropriate. Safety zones will ultimately be temporary, ending when the relevant operation ceases; and
- (d) The Signatories should promptly notify each other as well as the Secretary-General of the United Nations of the establishment, alteration, or end of any safety zone, consistent with Article XI of the Outer Space Treaty.<sup>105</sup>

For those familiar with American Property law, this clause ought to look remarkably like an artfully drafted version of the right to exclude being quietly inserted into outer space policy.

## II. THE DEBATE OVER PROPERTY RIGHTS IN SPACE

### A. The Debate over Property Rights

#### 1. *Arguments against Private Property Rights*

Not everyone is a fan of the exploitation of outer space resources. On a fundamental level, arguments against allowing private property rights tend to derive their basis from the Outer Space Treaty and its intentional omission of private property rights. Two particular sections—at least one author has argued that in reality it is two sentences<sup>106</sup>—are directly responsible for the argument against private property rights.

The first section giving cause for opposition to property rights in outer space is the Article I language articulating that the common

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<sup>105</sup> *Id.* §11, cl. 7.

<sup>106</sup> Megan Alexa MacKay, *Property Rights in Celestial Bodies: A Question of Pressing Concern to All Mankind*, 104 MARQ. L. REV. 575, 585 (2020).

heritage principle applies to outer space. This language states that, “the exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.”<sup>107</sup> Unfortunately, the Outer Space Treaty’s drafters chose not to define the key term “benefit,” leaving it unclear whether or not “benefit” could include economic benefits, environmental benefits (for example, reduced mining-generated pollution from tailings basins, acid drainage, or erosion), or any other beneficial outcomes. This section has resulted in further dispute about whether the common heritage principle precludes private property ownership.

The second section raising concern over the establishment of private property rights is Article II. In its entirety, Article II reads, “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.”<sup>108</sup> It is unclear whether this Article is intended to also exclude private appropriation. However, read together with Article I’s statement that space is for the use and benefit of all nations, it should be clear that any State in which the means of production are State-owned would potentially be disadvantaged because property rights—and arguably sovereignty—would lie with the State. As a result, the prohibition on State sovereignty would preclude such States from benefitting from outer space resources.

Case law, unsurprisingly, has not helped develop the meaning of either article.<sup>109</sup> As a result, the strongest arguments against the establishment of private property come from vague aspects of the Outer Space Treaty. Each of the two articles discussed above is vague in its terms, and standard tools of statutory interpretation could lead to the conclusion that both (1) private property rights are barred, or (2)

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<sup>107</sup> Outer Space Treaty, *supra* note 26, art. I.

<sup>108</sup> *Id.* art. II.

<sup>109</sup> *See* *Nemitz v. U.S.*, No. CV–N030599–HDM, 2004 WL 3167042 (D. Nev. Apr. 26, 2004) (including a claim that the United States infringed upon ownership interest in the asteroid 433, “Eros”, by landing a space craft on it. In dismissing the case, the District Court never reached a decision on whether Nemitz had an ownership claim to an asteroid.).

private property rights are not barred. It is because of this ambiguity that neither argument seems particularly strong.

## 2. *Three Arguments in Favor of Private Property Rights*

While there is limited literature opposing the creation of private property rights in space, there is a growing body of scholarship in favor of property rights.<sup>110</sup> This Article focuses on three arguments: (1) the inevitability of space commercialization; (2) the regulation of actors in outer space; and (3) the facilitation of markets.

### i. Commercialization of Space is Inevitable

There is another argument in favor of private property rights in space: the inevitability of space resource exploitation. While not a legal argument, its inevitability bears mentioning. In conversations regarding the adoption of law or policy, principals often must contend with reality. In this case, the reality is that commercial resource exploitation is going to happen. The Moon Agreement foresaw this reality and attempted to control it, if not prevent it.<sup>111</sup>

Commercialization has outpaced the treaties and agreements governing the use of space. Blue Origin offers opportunities for space tourism,<sup>112</sup> and SpaceX will deliver payloads into space for a fee. Even more relevant to this topic, companies have already begun planning missions to search for asteroids suitable for mining purposes.<sup>113</sup>

For several years now, scholars have recognized that space commercialization is inevitable.<sup>114</sup> Law tends to be reactive, creating

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<sup>110</sup> See, e.g., Lawrence L. Risley, *An Examination of the Need to Amend Space Law to Protect the Private Explorer in Outer Space*, 26 W. STATE UNIV. L. REV. 47 (1999); Andrew R. Brehm, *Private Property in Outer Space: Establishing A Foundation For Future Exploration*, 33 WIS. INT'L L.J. 353 (2015); Abigail D. Pershing, *Interpreting the Outer Space Treaty's Non-Appropriation Principle: Customary International Law from 1967 to Today*, 44 YALE J. INT'L L. 149 (2019).

<sup>111</sup> Moon Agreement, *supra* note 55, art. 11.

<sup>112</sup> *Book Your Flight on New Shepard*, BLUE ORIGIN, <https://www.blueorigin.com/new-shepard/fly> (last visited Feb. 16, 2023).

<sup>113</sup> *Our missions*, ASTEROID MINING CORPORATION, <https://asteroidminingcorporation.co.uk/missions> (last visited Feb. 16, 2023).

<sup>114</sup> See e.g., Philip de Man, *The Exploitation of Asteroids and the Non-Appropriation Principle: Reflections on the Nature of Property Rights in Light of the US Space*

solutions only after theoretical problems have become real problems, even if those theoretical problems were entirely foreseeable. Here, the establishment of a property rights regime creates the opportunity to set expectations before problems arise.

## ii. Regulating Behavior of Actors

Because the commercialization of outer space is inevitable, the creation of private property rights is necessary as a tool to regulate the behavior of actors engaged in commercial space activity. Given that space is often considered to be the common heritage of mankind, questions arise over the status of resources which may be found in common heritage areas. In a typical scenario, these resources, often called common pool resources, are held in common and available to anyone capable of harvesting them. Commentators have found that, absent regulation, common ownership of resources can lead to waste.<sup>115</sup>

When property rights are defined, it becomes possible to regulate the activities associated with the right. For example, if a temporary right existed to possess a celestial body, or a portion of a celestial body, for the purposes of extracting resources, then the existence of that right would have a regulatory effect by allowing the possessor to restrict who may enter that celestial body and remove those resources. This protects the investments, activities, and expected returns of the possessor. It also, to an extent, limits the rate at which resources will be extracted.

Consequently, if regulation is beneficial, the next question is: how would we go about regulating commercial activity in space? The best solution comes from the Law of the Sea Convention.<sup>116</sup> Part V of

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*Resource Act of 2015*, 40 J. SPACE. L. 1 (2016); Devanshu Ganatra & Neil Modi, *Asteroid Mining and its Legal Implications*, 40 J. SPACE. L. 81 (2016); Sarah Coffey, *Establishing a Legal Framework for Property Rights to Natural Resources in Outer Space*, 41 CASE W. RESRV. J. INT'L L. 119 (2009).

<sup>115</sup> See Eliot T. Tracz, *Do Good Fences Make Good Neighbors? An Economic Approach to the Common Heritage Problem in Outer Space*, 16 ISSUES AVIATION L. & POL'Y 121 (2016) (employing a game theoretic approach to the common heritage problem).

<sup>116</sup> United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397.

the LS Convention details the creation and specifics of exclusive economic zones (EEZ).<sup>117</sup> Before discussing how the LOS Convention may be relevant to our understanding of outer space, it bears mentioning that exclusive economic zones deal with sovereignty, which the Outer Space Treaty forbids. To that end, it makes sense to consider the LOS Convention's grant of privileges as extending to entities rather than to states.

The LOS Convention describes rights and restrictions applicable to states within their own EEZ. Rights include exploring, exploiting, conserving, and managing natural resources.<sup>118</sup> These resources may be in the water superjacent to the seabed, in the seabed itself, or in the subsoil.<sup>119</sup> Another set of rights includes the exclusive right to construct and authorize and regulate the construction of installations and structures for the purposes of exploring and exploiting resources.<sup>120</sup>

As in the Artemis Accords, there are notice requirements. The LOS Convention requires that "due notice must be given of the construction of such artificial islands, installations or structures, and permanent means for giving warning of their presence must be maintained."<sup>121</sup> There is also a provision for the establishment of safety zones<sup>122</sup> – again similar to the Artemis Accords – and limitations on the extent of those safety zones.<sup>123</sup>

How does this help regulate outer space commercial activity? Space, like the ocean, is a vast expanse and subject to competing national and private interests. Regulations like those in the LOS Convention manage expectations about who can do what, where they can do it, and how it can be done. Adapting some of these regulations to apply in outer space makes a certain amount of sense, as the problems involving limited resources, navigation, and exploration are similar.

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<sup>117</sup> *Id.* § 55.

<sup>118</sup> *Id.* § 56(1)(a).

<sup>119</sup> *Id.*

<sup>120</sup> *Id.* §60(1)(b).

<sup>121</sup> *Id.* §60(3).

<sup>122</sup> *Id.* §60(4).

<sup>123</sup> *Id.* §60(5).

### iii. Facilitating Markets

Property rights are a fundamental piece of the free market. Indeed, Professor Harold Demsetz tried to explain the development of property rights by writing that “When a transaction is concluded in the marketplace, two bundles of property rights are exchanged.”<sup>124</sup> “Property rights,” Demsetz wrote, “are an instrument of society and derive their significance from the fact that they help a man form those expectations which can reasonably hold in his dealings with others.”

In a way, Professor Demsetz gets right to the heart of what property is. Leading property law scholar Joseph William Singer has written that “property concerns relations *among people*, not relations between people and things.”<sup>125</sup> With this understanding, it becomes clear why markets rely on property rights. As property is often described in terms of a bundle of sticks, a market is a place where the rights included in that bundle may be bartered between parties. For example, on the rental market, a landlord would choose to lease their rights to possess, to use and enjoyment, and to exclude, to another individual for a period of time. Similarly, the market allows a car dealer to transfer title, the right to possess, to use and enjoy, etc. to an individual interested in purchasing a vehicle.

When parties have no property rights in outer space resources, they not only lack title to the resources that they extract, but they also lack the means to legitimately transfer those materials. The certainty created by a system of property rights – that is, the knowledge of who has what rights in what property – allows for resources to be included in transactions. In a world in which commercialization is growing a space-based sector of the economy, the ability to exchange resources is of key importance.

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<sup>124</sup> Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. 347 (1967).

<sup>125</sup> SINGER, *supra* note 13.



### III. ESSENTIAL PROPERTY RIGHTS FOR OUTER SPACE RESOURCES

#### A. Economics of Property Rights

Nobel Prize winning economist Milton Friedman has written that “(f)reedom to own property is” an “essential part of economic freedom.”<sup>126</sup> It has been argued that, for an economy to reach its full potential, property rights must retain certain characteristics:

An efficient property rights system has the following characteristics: 1) universality-all resources are privately owned, and all entitlements completely specified; 2) exclusivity-all benefits and costs accrued as a result of owning and using the resources should accrue to the owner, and only to the owner, either directly or indirectly by sale to others; 3) transferability-all property rights should be transferable from one owner to another in a voluntary exchange; 4) enforceability-property rights should be secure from involuntary seizure or encroachment by others.<sup>127</sup>

As property law is traditionally taught, the property rights an individual owns in a resource or item are typically described as a bundle of sticks. The next section addresses what a fundamental “bundle of sticks” for outer space resources would look like, including: (1) the (qualified) right to possess; (2) the right to exclude; and (3) the right to transfer.

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<sup>126</sup> MILTON FRIEDMAN & ROSE FRIEDMAN, *FREE TO CHOOSE: A PERSONAL STATEMENT* 67 (1980).

<sup>127</sup> Todd Votteler, *The Little Fish That Roared: The Endangered Species Act, State Groundwater Law, and Private Property Rights Collide Over the Texas Edwards Aquifer*, 28 ENV'T L. 845, 875 (1998).

## B. Essential Property Rights

### 1. *The Right to Possess*

On a fundamental level, the right to possess resources obtained in outer space must be recognized before any other property right. The reason for this is simple, without the right to possess resources extracted from outer space, there is no need for a right to transfer those resources in the market, nor is there a need for a right to exclude others. Typically, “possession” means the ability to exercise “dominion and control” over a resource.<sup>128</sup> It is necessary that the right to possess must exist on two levels: the right to temporarily possess a celestial body and the permanent right to possess resources extracted from celestial bodies.

The right to possess resources extracted from celestial bodies should be easiest to conceptualize. Like the rule of capture, recognized in *Pierson v. Post*,<sup>129</sup> later extended to oil and gas,<sup>130</sup> and often amended by statute, individuals or companies should be able to claim those resources extracted from land (or celestial bodies) under their control.

The right to temporarily possess a celestial body is more complicated. There are several potential avenues through which a temporary right to possess a celestial body could be established. One is the aforementioned Rule of Capture. Under the Rule of Capture, an individual may claim ownership of a fugitive resource by preventing its means of escape. Scholars have delved more deeply into the rationale behind the Rule of Capture in an effort to explain when it is most efficient. While entertaining the Rule of Capture in relation to a hypothetical herd of bison, Dean Lueck wrote that:

In principle, and in fact, first possession rules can operate on different margins. For instance, the rule can grant ownership of a single bison to the first person that kills a bison, under the so-called rule of capture, or it can grant ownership of the entire herd to the first

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<sup>128</sup> See, e.g., *Pugatch v. Stoloff*, 671 N.E. 2d 995 (Mass. App. Ct. 1996).

<sup>129</sup> *Pierson v. Post*, 3 Cai. R. 175 (1805).

<sup>130</sup> See e.g., *Brown v. Humble Oil & Refining Co.*, 83 S.W.2d 935, 940 (Tex. 1935); *Elliff v. Texon Drilling Co.*, 210 S.W.2d 558, 561-562 (Tex. 1948).

person that claims ownership of the entire living herd. Similarly, the rule can grant ownership of a barrel of crude oil to the first to bring it to the surface or grant ownership of the entire reservoir to the first successful driller. The behavior of the possessor and the use of the bison or petroleum resource will obviously differ in the two cases. In the initial case, first possession applies to the *flow* of output from the *stock* of living bison or oil reservoir, while in the second case, the rule applies to the stock itself. In the bison example, the rule of capture is expected to emerge—and in fact did—because the cost of enforcing possession to the live herd is prohibitive. For similar reasons, the rule of capture emerged in the law of oil and gas.<sup>131</sup>

In other words, rules like the Rule of Capture, are expected to come into being when it is either impossible or inefficient to grant property rights to a larger asset. Celestial bodies certainly fall within this category of assets, given their distance from earth, potential size, and other unknown characteristics.

A second possibility would be an extension of the Discovery Doctrine. A controversial doctrine at best, the Doctrine of Discovery has been described by Tonya Gonnella Frichner in the following terms:

A Christian Monarch who locates or discovers non-Christian lands and territories has the right to claim a superior and paramount title to these lands, territories, and resources. The Doctrine of Discovery states that non-Christian lands are considered to belong to no one because no Christians are living there and no Christian monarch or lord has yet claimed dominion. Once [a Christian monarch made] the claim of a right to

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<sup>131</sup> Dean Lueck, *The Rule of First Possession and the Design of the Law*, 38 J. L. & ECON. 393, 396 (1995).

dominion, sovereignty, and lordship, . . . that claim was transferable to other political successors.<sup>132</sup>

In more legal terminology, Chief Justice John Marshall wrote that the European powers, having similar goals, recognized that:

it was necessary, in order to avoid conflicting settlements, and consequent war with each other, to establish a principle, which all should acknowledge as the law by which the right of acquisition, which they all asserted, should be regulated as between themselves. This principle was, that discovery gave title to the government by whose subjects, or by whose authority, it was made, against all other European governments, which title might be consummated by possession.<sup>133</sup>

Marshall further stated that the Doctrine of Discovery, “was a right which all asserted for themselves, and to the assertion of which, by others, all assented.”<sup>134</sup>

It would be remiss not to acknowledge the deeply racist foundations upon which the Doctrine of Discovery rest. Nor would it be acceptable to ignore the great harms visited upon indigenous peoples by continuing court acceptance of the Doctrine of Discovery. But those topics—which are important issues worthy of lengthy discussion—are beyond the scope of this Article. Here, the concern is whether the Doctrine of Discovery can be adapted to use in outer space. In this context, the Doctrine of Discovery may in fact prove useful.

This doctrine could create a property regime in which companies who discover an extractable resource on a celestial body acquire a limited right to possess that body until the resource has been extracted or the right to possess is transferred or abandoned. Admittedly, this might encourage companies to seek to discover

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<sup>132</sup> Tonya Gonnella Frichner, *The “Preliminary Study” on the Doctrine of Discovery*, 28 PACE ENV'T. L. REV. 339, 341-42 (2010) (footnote omitted).

<sup>133</sup> *Johnson v. M'Intosh*, 21 U.S. 543, 573 (1823).

<sup>134</sup> *Id.*

resources but not take steps to begin extraction as a means of controlling supply. So, a property regime utilizing the Doctrine of Discovery might include a specific time in which the discovering entity must either begin the process of extraction or risk losing the right of possession.

Doubtless other methods of acquiring a temporary right to possession could exist. And it is certainly fair to claim that these suggested methods favor a free market, Western centered view of property rights. As it stands, however, these two methods seem to be (a) the most likely to garner international support, and (b) the least difficult to implement.

Finally, it bears mentioning that “possession” is distinct from “ownership.” That an entity may exercise temporary dominion and control over a celestial body, does not necessarily lead to the legal conclusion that title to that celestial body rests with the possessor. This is relevant for two reasons. First, in a country in which means of production are State owned, any right to possess a celestial body—limited or otherwise—could conflict with the Outer Space Treaties prohibition on claims of sovereignty. Second, by creating a temporary right to possess rather than a right to title, the goal of preserving space as the common heritage of mankind is maintained.

## 2. *The (limited) Right to Exclude*

If you were to ask a cross-section of law professors and practitioners what the most fundamental property right is, they would likely tell you that it is the right to exclude.<sup>135</sup> But how would one go about limiting the right to exclude in outer space? The Artemis Accords indirectly suggest one possible way.

Section 11 of the Artemis Accords deals with Deconfliction of Space Activities. In doing so, it directly references the Outer Space Treaty and its provisions “relating to due regard and harmful

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<sup>135</sup> See e.g., Jace C. Gatewood, *The Evolution of the Right to Exclude—More Than a Property Right. A Privacy Right*, 32 MISS. COLL. L. REV. 447, 448 (2014); Thomas W. Merrill, *Property and the Right to Exclude*, 77 NEB. L. REV. 730, (1998) (arguing that “the right to exclude others is more than just ‘one of the most essential’ constituents of property—it is the *sine qua non*.”).

interference.”<sup>136</sup> The Artemis Accords also proclaim that Signatories “commit to seek to refrain from any intentional actions that may create harmful interference with each other’s use of outer space in their activities” under the Accords.<sup>137</sup>

The framework adopted by the Artemis Accords relies on the Signatories willingness to provide one another with information regarding the location and nature of space-based activities if a Signatory has reason to believe that the activities of other Signatories may result in harmful interference with, or create a safety hazard to, that Signatory’s activities.<sup>138</sup> This allows for the creation of “safety zones,” which are described as “the area in which nominal operations of a relevant activity or an anomalous event could reasonably cause harmful interference.”<sup>139</sup> In addition to facilitating the creation of safety zones, the Artemis Accords also set forth certain principles related to safety zones, including:

- (a) The size and scope of the safety zone, as well as the notice and coordination, should reflect the nature of the operations being conducted and the environment that such operations are conducted in;
- (b) The size and scope of the safety zone should be determined in a reasonable manner leveraging commonly accepted scientific and engineering principles;
- (c) The nature and existence of safety zones is expected to change over time reflecting the status of the relevant operation. If the nature of an operation changes, the operating Signatory should alter the size and scope of the corresponding safety zone as appropriate. Safety zones will ultimately be temporary, ending when the relevant operation ceases;
- (d) The Signatories should promptly notify each other as well as the Secretary-General of the United Nations of

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<sup>136</sup> Artemis Accords, *supra* note 4, §11(1).

<sup>137</sup> *Id.* §11(4).

<sup>138</sup> *Id.* §11(5).

<sup>139</sup> *Id.* §11(7).

the establishment, alteration, or end of any safety zone, consistent with Article XI of the Outer Space Treaty.<sup>140</sup>

The language adopted by the Artemis Accords certainly seems to create a right to exclude others from operating in the same area. This is particularly true given that “harmful interference” is undefined in the accords, and so could imply anything from personal safety of individuals to economic prospects of the actors themselves.

Other possible means of establishing a right to exclude exist. EEZs are another alternative already in use by many coastal countries. The problem faced by any method of establishing a right to exclude is garnering international agreement. The Artemis Accords have already garnered limited support, and so may present the most effective model for establishing a right to exclude.

### 3. *The Right to Transfer*

The third necessary stick in the outer space property rights bundle is the right to transfer property. This right answers the question of, as Professor Richard Epstein has put it, “what happens” to a resource when “its value in use to somebody else is greater than its value in use to you?”<sup>141</sup> It is clear that the right to transfer title in property from one entity to another is a fundamental—perhaps *the* fundamental—aspect of market transactions. To that end, a property rights regime enacted with the view towards creating a viable market for outer space resources must include a right to transfer title to those resources.

At the same time, the right to transfer applies to more than just the ability to sell resources in the marketplace. Operating in space is

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<sup>140</sup> *Id.* §11(7) (a)-(d). Article XI of the Outer Space Treaty states: “In order to promote international co-operation in the peaceful exploration and use of outer space, States Parties to the Treaty conducting activities in outer space, including the moon and other celestial bodies, agree to inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities. On receiving the said information, the Secretary-General of the United Nations should be prepared to disseminate it immediately and effectively.”

<sup>141</sup> Richard A. Epstein, *Property and Necessity*, 13 HARV. J. L. & PUB. POL’Y 2, 3 (1990).

costly and financial insolvency is a risk that all companies face. Courts must be able to transfer title and possession from debtor companies to their creditors in an efficient manner. This cannot be done without a right to transfer. Similarly, a company which has been acquired by another entity must have the ability to transfer title to its assets.

#### 4. *Enforcement*

Establishing property rights is essential for the commercialization of space, but more is still needed. While property rights establish boundaries and set expectations for interactions between parties, an enforcement mechanism is still necessary. This Article suggests a two-part approach to enforcement: (1) include a basic plan for commercial activity as part of the launch registry filing and (2) amend the liability convention to address commercial disputes.

As discussed above, the Registry Convention established certain information which must be provided to the international launch registry maintained by UNOOSA.<sup>142</sup> It would not be particularly difficult to add some additional information to this filing. The filing should include the location and expected duration of the commercial activity as well as a general description of the anticipated activity. This information would provide notice of who is doing what, where they are doing it, and the timeframe during which it will be done.

The Liability Convention already addresses liability for certain harms caused by outer space activity.<sup>143</sup> More importantly, it provides the means for the resolution of disputes between parties. Article X of the Liability Convention states that a claim must be brought to the Launching State within one year of the harm, unless the Launching State cannot be identified.<sup>144</sup> These claims shall be brought through diplomatic channels, rather than traditional legal channels.<sup>145</sup> At the same time, the Liability Convention does not preclude the initiation of lawsuits outside of the coverage of the Liability Convention, nor does it require that any outside remedies be exhausted before pursuing

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<sup>142</sup> Registration Convention, *supra* note 68, art. VII.

<sup>143</sup> *See* Liability Convention, *supra* note 61.

<sup>144</sup> *Id.* art. X.

<sup>145</sup> *Id.* art. IX



relief through the Liability Convention.<sup>146</sup> Finally, if no settlement is reached within a year of presentation of the claim, a Claims Commission may be appointed at the request of either party.<sup>147</sup>

#### CONCLUSION

Recent growth in both the number of space operators and the scope of their commercial activities in outer space has necessarily led to a point in which the exploitation of outer space resources is less of an aspect of science fiction and more of a pending reality. Already, numerous companies have begun planning missions to assess the ability to extract resources from celestial bodies. The looming onset of asteroid mining raises legal questions about whether entities can hold property rights in outer space, and the implications are huge.

Property rights are a fundamental piece of a free market. They facilitate exchanges of resources, manage expectations about who can do what and where they can do it, and encourage individuals to play by the rules. Because of these advantages, space commercialization would benefit from the establishment of a set of property rights—only those rights essential for a market to function—sooner rather than later.

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<sup>146</sup> *Id.* art. XI.

<sup>147</sup> *Id.* art. XIV.