THE FINAL FRONTIER: A LOOK AT PRIVATE MINING RIGHTS IN SPACE

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I. INTRODUCTION

The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space (the Outer Space Treaty) is the current master document outlining international space law.[1] Subsequent treaties and U.N. resolutions have followed, further defining the scope of the Outer Space Treaty, but the Outer Space Treaty remains the foundation for each new piece of space legislation.[2] Each nation signatory interprets the principles of this legislation and applies them to their respective domestic law.[3] This process has effectively created a "soft law" that does not directly address commercial interests.[4] Instead, the Outer Space Treaty provides that "[o]uter space, including the [M]oon 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."[5]

At the time of the Outer Space Treaty's conception, State Parties did not account for the privatization of space, and as such, the treaty is silent on commercial operations. However, Moon and asteroid mining presents an incredibly profitable business venture for resource gathering. Asterank, a scientific and economic database cataloging over 6,000 NASA-tracked asteroids, estimates mining just the top ten most cost-effective asteroids would produce a profit of around $1.5 trillion.[6] These asteroids contain both industrial metals and precious metals, as well as ice that can be converted into drinking water, breathable air, and rocket fuels for use in a future space economy.[7]

This paper argues that the current domestic and international legal framework insufficiently addresses private industry's resource-gathering rights on the Moon and other heavenly bodies. This paper seeks an alternative to the existing framework through the passage of new treaties advocating alienable property rights and using a bottom-up approach to governance before establishing international regulatory bodies to oversee these rights.

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1. Henry Hertzfeld, *Current and Future Issues in International Space Law*, 15 ILSA J. OF INT'L & COMPARATIVE L. 325, 328-29 (2009).

2. *Id.*; *see also* Loren Grush, *How an international treaty signed 50 years ago became the backbone for space law*, THE VERGE (Jan. 27, 2017, 10:14 AM), https://www.theverge.com/2017/1/27/14398492/outer-space-treaty-50-anniversary-exploration-guidelines.

3. Hertzfeld, *supra* note 1, at 330.

4. *Id.* at 330-31.

5. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies art. II, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

6. Shriya Yarlagadda, *Economics of the Stars: The Future of Asteroid Mining and the Global Economy*, HARVARD INT'L REV. (Apr. 8, 2022, 9:00 AM), https://hir.harvard.edu/economics-of-the-stars/.

7. Andy Greenspon, *Precious metals in peril: Can asteroid mining save us?*, HARVARD UNIV. THE GRADUATE SCH. OF ARTS AND SCI.: SCI. IN THE NEWS (Oct. 25, 2016), https://sitn.hms.harvard.edu/flash/2016/precious-metals-peril-can-asteroid-mining-save-us/.

Part II of this article discusses the current legal framework surrounding space. It addresses the burgeoning private space industry and its property rights under the Outer Space Treaty and subsequent treaties. Part III of this article highlights current international property rights frameworks and United States domestic property rights analogous to extraterrestrial mining, including high seas fishing, high seas mining, and United States mining law. Part IV of this article examines the need for new multilateral treaties to advocate for private resource-gathering rights, filling the void in the existing legal framework surrounding space, and describes how a bottom-up approach to governance should be used before regulatory bodies can be shaped to manage these resource-gathering rights. Part V of this article recommends solutions to the current legal framework and advocates for the passage of new treaties and legislation promoting a defined system of alienable resource-gathering property rights before establishing international regulatory bodies to oversee these rights.

II. CURRENT LEGAL FRAMEWORK OF SPACE

Humanity has once again set its sights on space.[8] United States President Joe Biden has committed to NASA's Artemis Program, which will land the first woman and first person of color on the Moon.[9] Similarly, China landed a probe on the far side of the Moon in 2019, and Russia is attempting to resurrect its lunar program.[10]

Technological advancements in rocket recovery and reusable launch systems have significantly decreased the costs associated with rocket launches.[11] Private companies have been at the forefront of developing these reusable rocket systems.[12] To reap these cost savings, NASA has increasingly turned to public-private partnerships to achieve its goals in space.[13] But, as space becomes commercialized, questions remain unanswered regarding private resource rights on heavenly bodies.[14]

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8. Kate Evans, *Hear Ye! Hear Ye! A Declaration of the Rights of the Moon*, EOS (July 20, 2021), https://eos.org/features/hear-ye-hear-ye-a-declaration-of-the-rights-of-the-moon.

9. *Id.*

10. *Id.*

11. Steinar Lag, *Reusable rockets: revolutionizing access to outer space*, DNV (last visited May 22, 2024), https://www.dnv.com/to2030/technology/reusable-rockets-revolutionizing-access-to-outer-space.html.

12. *Id.*

13. Michael Sheetz, *NASA awards Blue Origin, Northrop Grumman and Nanoracks with contracts to build private space stations*, CNBC (Dec. 2, 2021, 3:20 PM), https://www.cnbc.com/2021/12/02/nasa-private-space-station-contracts-blue-origin-nanoracks-northrop.html.

14. *See* Nahal Toosi, *Who owns the moon?*, POLITICO (June 13, 2019, 4:59 AM), https://www.politico.com/agenda/story/2019/06/13/space-travel-moon-resources-000899/.

The 1950s started the "space race" between the United States and the Soviet Union.[15] Nations became fearful of nuclear weapons and the militarization of space.[16] In 1960, President Eisenhower recommended that the principles surrounding the Antarctic Treaty of 1959 be applied to space and celestial bodies.[17] Then, in 1965, the United States proposed a treaty to the United Nations outlining the peaceful use of space.[18] This proposal culminated in the Outer Space Treaty and was opened for signature in the United States, the United Kingdom, and the Soviet Union in January 1967.[19] The Outer Space Treaty entered into force in October 1967.[20] Borrowing from its predecessor, the Antarctic Treaty, the Outer Space Treaty stressed that no nation could claim ownership over any celestial body in space.[21] Today, this treaty has 114 State Parties.[22]

The Outer Space Treaty contains seventeen articles, five articles being particularly pertinent for analyzing property rights.[23] Articles I and II generally claim that space belongs to humankind, not nations, and space exploration and use shall be carried out to benefit all countries.[24] Article IV prescribes that such use shall be entirely peaceful.[25] Article VI holds that State Parties bear responsibility for national activities in outer space, and the activities of non-governmental entities shall require authorization and supervision by their respective State Parties.[26] Article VIII states that each party who launches an object into outer space retains control and jurisdiction over the object.[27] Article XII provides that all stations, installations, equipment, and space vehicles on the Moon and other heavenly bodies shall be open to representatives of other State Parties to the treaty.[28]

The Outer Space Treaty has provided the basis for all subsequent space legislation.[29] The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement) was adopted by

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15. Bailey DeSimone, *How the Antarctic Treaty of 1959 Influenced the Outer Space Treaty of 1967*, LIBR. OF CONG. (Jan. 28, 2022), https://blogs.loc.gov/law/2022/01/how-the-antarctic-treaty-of-1959-influenced-the-outer-space-treaty-of-1967/.

16. *Id.*

17. *Id.*

18. *Id.*

19. *Id.*

20. *Id.*

21. *Id.*; *see also* Outer Space Treaty, *supra* note 5.

22. *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, UNODA, https://treaties.unoda.org/t/outer_space (last visited May 22, 2024).

23. Outer Space Treaty, *supra* note 5.

24. *Id.*

25. *Id.*

26. *Id.*

27. *Id.*

28. *Id.*

29. Grush, *supra* note 2.

the U.N. General Assembly in 1979 and entered into force in July 1984.[30] The Moon Agreement reaffirms and elaborates on many of the provisions of the Outer Space Treaty as applied to the Moon.[31] Article 11 provides that the Moon and its natural resources are the common heritage of humankind and shall never become the property of any State, non-governmental organization or entity, or natural person.[32] However, the United States is not a signatory to this treaty.[33]

Recent domestic United States law suggests that the U.S. recognizes that private U.S. companies have property rights to the resources they gather in space.[34] For instance, the U.S. Commercial Space Launch Competitiveness Act (the SPACE Act) directs the President to "promote the right of United States citizens to engage in commercial . . . recovery of space resources."[35] However, this remains untested; NASA has contracted with several companies to mine the lunar surface for lunar soil, but these projects are not yet underway.[36]

The most recent United States legislation concerning the use of outer space is the Artemis Accords.[37] The Artemis Accords are an international agreement recently put forth by NASA between the United States and several partner nations, governing space exploration cooperation among nations participating in NASA's twenty-first century lunar exploration plans.[38] These Accords come on the heels of NASA's anticipated Artemis program, which would culminate in a crewed Moon landing mission, a new space station in lunar orbit, a habitable Moon base, and a crewed Mars landing mission.[39]

While the Artemis Accords expressly state its principles provide for the operational implementation of obligations contained in the Outer Space Treaty, it also clarifies property ownership in space.[40] Section 10

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30. *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, UNOOSA, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/intromoon-agreement.html (last visited May 22, 2024).

31. *Id.*

32. *Id.*

33. *Outer Space Law*, UNIV. OF CONN., https://libguides.law.uconn.edu/c.php?g=1047257&p=7603529#s-lg-box-25700934 (last visited May 22, 2024).

34. *See* H.R. 2262, 114th Cong. (2015) (enacted).

35. *Id.* § 51302(a)(3).

36. Christian Davenport, *A dollar can't buy you a cup of coffee but that's what NASA intends to pay for some moon rocks*, THE WASH. POST (Dec. 3, 2020, 3:23 PM), https://www.washingtonpost.com/technology/2020/12/03/moon-mining-contracts-named/.

37. Media Note from the Off. of the Spokesperson, *First Meeting of Artemis Accords Signatories* (Sept. 19, 2022), https://pl.usembassy.gov/artemis/.

38. Press Release, NASA, NASA, International Partners Advance Cooperation with First Signings of Artemis Accords (Oct. 13, 2020), https://www.nasa.gov/news-release/nasa-international-partners-advance-cooperation-with-first-signings-of-artemis-accords/.

39. *Follow the NASA Artemis missions*, ROYAL MUSEUMS GREENWICH, https://www.rmg.co.uk/stories/topics/nasa-moon-mission-artemis-program-launch-date (last visited May 22, 2024).

40. *Artemis Accords Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids for Peaceful Purposes,* NASA (Oct. 13, 2020), https://www.nasa.gov/artemis-accords/.

governs space resources and states, "the extraction and utilization of space resources, including… from the surface or subsurface of the Moon, Mars, comets, or asteroids, should be executed in a manner that complies with the Outer Space Treaty."[41] It further states that "the extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty."[42] Like the Outer Space Treaty, the Artemis Accords are silent on resource rights to private individuals.[43] As of September 19, 2022, twenty-one countries have signed the Artemis Accords.[44]

III. CURRENT INTERNATIONAL AND UNITED STATES DOMESTIC PROPERTY RIGHTS

Private companies will not invest the capital needed to mine heavenly bodies without legal certainty of their ownership rights in those resources.[45] Scholars argue that a traditional right to property does not exist under international law; instead, property rights only arise under the domestic law of a particular nation.[46] A global right to property has been debated for decades but has ultimately been deemed "extremely difficult" to establish as it would require a right "(1) incorporated into 'the national law of all states' and (2) 'capable of being given the same weight in domestic courts.'"[47] The legal uncertainties posed by the Outer Space Treaty leave the question: Can we analogize any current legal framework to mining in outer space?

A. High Seas Fishing

Previous NASA director Jim Bridenstine has likened lunar resource extraction to rules governing the sea, stating, "[w]e do believe we can extract and utilize resources of the moon, just as we can extract and utilize tuna from the ocean."[48]

The United Nations Convention on the Law of the Sea provides a comprehensive regime of the laws that govern the world's oceans.[49] This

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41. *Id.*
42. *Id.*
43. *Id.*
44. Media Note from the Off. of the Spokesperson, *supra* note 37.
45. *See* JP Floru, *Mining the Moon: How Private Property Rights in Space Bring Limitless Opportunities*, ADAM SMITH INST. (Dec. 17, 2019), https://www.adamsmith.org/blog/mining-the-moon-how-private-property-rights-in-space-bring-limitless-opportunities.
46. John G. Sprankling, *The Global Right to Property*, 52 COLUM. J. TRANSNAT'L L. 464, 465, 470 (2014).
47. *See id.* at 470.
48. Christian Davenport, *NASA announces it's looking for companies to help mine the moon*, THE WASH. POST (Sept. 10, 2020, 2:00 PM), https://www.washingtonpost.com/technology/2020/09/10/moon-mining-nasa-search/.
49. U.N. Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397, https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf [hereinafter UNCLOS].

convention entered into force on November 16, 1994, and is globally recognized as the leading source of all matters relating to the law of the sea.[50] This treaty creates a multitude of zones that extend outwards from each coastal State into their surrounding water.[51] The "territorial sea" is defined as the zone extending beyond a state's land territory into the sea to a limit not exceeding twelve nautical miles.[52] Sovereignty of this area extends to both the airspace and the sea bed and subsoil.[53] The "exclusive economic zone" is the sea beyond and adjacent to the territorial sea and extends outward from the territorial sea for no longer than 200 nautical miles.[54] While a State has full jurisdiction over its territorial zone, a State only has jurisdiction over the resources within its exclusive economic zone.[55] These resources include fish, offshore oil, and gas.[56] Each State has the jurisdiction to govern the use of these resources within its exclusive economic zone, including issuing licenses, setting catch limits, or banning activities entirely.[57] The area outside the jurisdiction of signatory parties is considered the "high seas."[58] However, the treaty provides that "[a]ll States have the right for their nationals to engage in fishing on the high seas."[59]

The ability to fish on the high seas may not be as simple as Bridenstine suggests. First, the 1982 U.N. Convention on the Law of the Sea (UNCLOS) lays out obligations for high seas fishing to comply with the treaty.[60] UNCLOS requires that nationals comply with their respective State's treaty obligations, cooperate with other State Parties to the treaty, and do so in an environmentally conservatory manner.[61] Second, international law puts significant limits on States' rights to authorize their nationals to fish on the high seas.[62] High seas fisheries are often overseen by regional fisheries management organizations (RFMOs).[63] These international bodies consist of countries interested in

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50. *Id.*

51. *Id.*

52. *Id.* at 27.

53. *Id.*

54. *Id.* at 44.

55. R. Hannesson, *The Exclusive Economic Zone: What It Is*, SCIENCEDIRECT (2013), https://www.sciencedirect.com/topics/earth-and-planetary-sciences/exclusive-economic-zone.

56. *Id.*

57. Kimbra Cutlip, *Who Owns the Fish: High Seas and the EEZs*, Global Fishing Watch (July 1, 2016), https://globalfishingwatch.org/fisheries/who-owns-the-fish-high-seas-and-the-eezs/.

58. *See* UNCLOS, *supra* note 49, at 57.

59. *Id.* at 65.

60. *Id.*

61. *Id*. at 46–49, 65–66.

62. Stefán Ásmundsson, *Freedom of Fishing on the High Seas, and the Relevance of Regional Fisheries Management Organisations (RFMOs)*, CONVENTION ON BIOLOGICAL DIVERSITY, https://www.cbd.int/doc/meetings/mar/soiom-2016-01/other/soiom-2016-01-fao-18-en.pdf (last visited May 30, 2024).

63. *Id.*

managing fish stocks in a particular region.[64] The U.N. Fish Stocks Agreement (UNFSA) makes RFMOs relevant to all States, not just the members of the specific RFMO. Article 8(4) of UNFSA provides that "[o]nly those States which are members of such an organization or participants in such an arrangement, or which agree to apply the . . . measures established by such organization or arrangement, shall have access to the fishery resources to which those measures apply."[65] This bright-line rule makes it apparent that if States do not explicitly abide by either of these conditions, they do not have the freedom to fish on the high seas.[66] Article 8(5) of UNSFA goes further and provides that if there is no RFMO, relevant coastal States and States fishing in the region shall cooperate to either establish an RFMO or come to an agreement to ensure the conservation and management of the fishing stock.[67] UNSFA currently has more than eighty parties, including most major fishing States.[68]

There are many parallels between the high seas and space. Both areas have valuable resources, and neither can be appropriated by any sovereign under relevant international agreements. High seas fishing has existed much longer and is much more practical than outer space mining, which has led to a desire for regulatory bodies to oversee high seas fishing ventures. This desire for a robust regulatory approach to high seas fishing is apparent from the formation of RFMOs. While the lack of international regulatory bodies for outer space mining may suggest that this mining would not potentially conflict with international law, it does not mean there would be no blowback from the international community echoing a similar desire for regulation as seen in high seas fishing.

The sentiment that the Outer Space Treaty allows private individuals to mine outer space, expressed by the United States in the SPACE Act, is not reciprocated entirely internationally.[69] Notably, Russia has condemned asteroid mining as violating the Outer Space Treaty.[70] But, Russian private tech companies, such as Dauria Aerospace, are involved in plans for drilling rigs, space stations, and water extraction

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64. *FAQ: What is a Regional Fishery Management Organization*, THE PEW CHARITABLE TR. (Feb. 23, 2012), https://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2012/02/23/faq-what-is-a-regional-fishery-management-organization.

65. Ásmundsson, *supra* note 62, at 1–2.

66. *Id.*

67. *Id.* at 2.

68. *Id.*

69. Cecilia Jamasmie, *Russia slams Trump's order to spur mining on the moon*, MINING.COM (Apr. 9, 2020, 3:53 AM), https://www.mining.com/russia-slams-trumps-order-to-spur-mining-the-moon-asteroids/.

70. Paul Ratner, *Who owns space? Here's what laws govern space exploration*, INTERESTING ENGINEERING (Apr. 23, 2022), https://interestingengineering.com/science/who-owns-space-exploration.

stations on the Moon.[71] Actions from other nations have expressed a more favorable outlook on public and private outer space mining.[72] Luxembourg looks to become the hub for European space mining as the country plans on creating a European Space Resources Innovation Centre.[73] Luxembourg looks to collaborate with the European Space Agency in using space resources such as water on the Moon and minerals found in asteroids.[74] It also looks to support commercial initiatives and start-ups, and has announced the opening of a $225 million line of credit for private space companies to set up their European headquarters within Luxembourg.[75]

With so many international actors interested in pursuing privatized space mining, each with varying interpretations of how mining may be conducted, experts are concerned with its environmental impact.[76] Due to the decades of lightly regulated space activities, space debris already threatens crew and satellites in low-earth orbit.[77] Some experts fear that lunar pollution may be next.[78] Others see a significant upside in the lack of environmental impact here on Earth.[79] Conducting mining in outer space would help supplant the need for traditional in-the-ground mining methods here on Earth that release toxic chemicals like arsenic and lead into our waterways and contribute to acid mine drainage.[80]

Regardless, a lesson must be taken from using RFMOs in deep-sea fishing. As discussed, there is no doubt that States and their private actors currently disagree on whether celestial bodies are subject to mining. When the time comes, there will likely be disagreement on the proper policies and procedures surrounding the mining process, such as waste disposal. If mining operations are to be conducted peacefully and safely in space, the international community will surely want some guiding legal framework. Eventually, regulatory bodies overseeing different regional mining practices may prove useful. Having different regional bodies, rather than one large body to oversee all mining operations, may prove especially useful when dealing with terrain such as the Moon's and the difficulties it will take to traverse it. These bodies would be more familiar with the terrain surrounding their respective mining operations. They would be better suited to decide which places

71. *Id.*

72. Cecilia Jamasmie, *Luxembourg to set up Europe space mining centre*, MINING.COM (Nov. 18, 2020), https://www.mining.com/luxembourg-to-create-space-resources-centre/.

73. *Id.*

74. *Id.*

75. *Id.*

76. Alex Gilbert, *Mining in Space Is Coming*, MILKEN INST. (Apr. 26, 2021), https://www.milkenreview.org/articles/mining-in-space-is-coming.

77. *Id.*

78. *Id.*

79. Yarlagadda, *supra* note 6.

80. *Id.*

are to be off-limits for mining for purposes such as conserving geological formations or preserving historic landmarks.[81]

B. High Seas Mining

Though NASA has likened outer space mining to high seas fishing, high seas mining laws may serve as a better comparison. UNCLOS also provides the current legal framework for deep seabed mining.[82] It states, in relevant part, "[n]o State shall claim or exercise sovereignty over any part" of the deep seabed.[83] Similar to the Outer Space Treaty, it also prescribes that the deep seabed and its resources "are the common heritage of mankind."[84]

The United States has neither signed nor ratified UNCLOS.[85] This wariness for ratification comes from fears among conservative members of Congress that UNCLOS would "undermine U.S. sovereignty by transferring 'ownership' of the high seas to the United Nations."[86] Instead, the United States entered multilateral agreements with other nations, adopting the Deep Seabed Hard Minerals Resources Act (DSHMRA) in 1980.[87] DSHMRA established a licensing regime for deep seabed mineral resources, emphasizing the conservation and protection of the marine environment.[88] The act provides access to U.S. citizens for the extraction of "deep seabed resources" and "assur[es] that any mining activities that U.S. citizens engage in prior to the signing of any international regime will be allowed to continue."[89]

On the other hand, UNCLOS established the International Seabed Authority (ISA), which regulates and controls deep seabed mining activities.[90] The ISA comprises three "organs," the Council, the Assembly, and the Secretariat, each with separate functions.[91] The Council administers regulations for deep-sea mining, the Assembly issues decisions on sharing mining revenues, and the Secretariat carries out administrative functions.[92] Entities pay a $500,000 application fee

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81. *See generally* Sophie Fessl, *Should the Moon Landing Site Be a National Historic Landmark?*, JSTOR (July 10, 2019), https://daily.jstor.org/should-the-moon-landing-site-be-a-national-historic-landmark (noting that anthropologist Beth O'Leary proposed Tranquility Base become a National Historic Landmark).

82. UNCLOS, *supra* note 49.

83. *Id.* at 52.

84. *Id.* at 50.

85. Anya Wahal, *On International Treaties, the United States Refuses to Play Ball*, COUNCIL ON FOREIGN RELS. (Jan. 7, 2022), https://www.cfr.org/blog/international-treaties-united-states-refuses-play-ball.

86. *Id.*

87. Laura C. Byrd, *Soft Law in Space: A Legal Framework for Extraterrestrial Mining*, 71 EMORY L. J. 801, 811 (2022).

88. *Id.*

89. *Id.*

90. UNCLOS, *supra* note 49.

91. Byrd, *supra* note 87.

92. *Id.*

to the ISA, which approves these applications on a first-come, first-served basis.[93] Approved applicants must set aside areas for future use by the commercial arm of the ISA, the Enterprise.[94] The Enterprise may conduct mining operations on its own, as well as "act as a partner in joint ventures with licensed contractors."[95]

The differences in how the United States and the international community view outer space mining are paralleled by their treatment of deep-sea resources. The United States maintains an "America First" stance with its refusal to ratify UNCLOS, instead opting for more domestic-favoring legislation with DSHMRA. This position translates to outer space mining with America's stance outlined in the SPACE Act, which was then followed up with the Artemis Accords. Both acts maintain a firm stance that the United States does not interpret private commercial space resource extraction as national appropriation in conflict with the Outer Space Treaty.[96] The international community tends to express a desire for an international regulatory body when dealing with matters not strictly located within a State's well-defined borders. This is evidenced through the use of UNCLOS to establish RFMOs for deep-sea fisheries and the ISA to regulate deep-sea mining endeavors.[97]

This is an important takeaway for the United States if it seeks to permit privatized space mining without stepping on the toes of the international community. Even if the United States were to give the green light to U.S. corporations to mine, the resources obtained may end up in global commerce. Corporations will not put forth the money to fund such endeavors if nations outside the United States contest their absolute property rights to these resources. These multinational corporations will likely not want to disregard the sentiment of the rest of the world when conducting these operations, especially if the international community views these actions as illegitimate or in conflict with existing international law.

C. Current U.S. Domestic Property Rights

The United States is broadly understood to possess a strong interest in private property, which has been a driving force behind its economic and political systems.[98] This sentiment is apparent in its system of mining rights.

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93. *Id.* at 811–12.
94. *Id.* at 812.
95. *Id.*
96. *See generally* H.R. 2262, *supra* note 34; *see also* Artemis Accords, *supra* note 40.
97. *See generally* UNCLOS, *supra* note 49.
98. Harvey M. Jacobs, *U.S. Private Property Rights in International Perspective, in* PROPERTY RIGHTS AND LAND POLICIES 53 (Gregory K. Ingram & Yu-Hung Hong eds., 2008).

Mining rights in the United States are conferred through "[a]n Act to promote the Development of the mining Resources of the United States" (the General Mining Law).[99] Under the General Mining Law, both individuals and corporations may prospect and stake claim to mineral discoveries on public domain lands.[100] The Congressional Research Service has defined public domain land as lands "'retained under federal ownership since their original acquisition by treaty, cession, or purchase as part of the general territory of the United States.'"[101] Public domain lands differ from acquired lands, which the federal government obtains through gift, purchase, or condemnation from a state or private owner.[102]

Under the General Mining Law, a United States citizen, or those who have declared their intent to become a United States citizen, "may 'locate' (or stake)" a claim on a valuable mineral deposit.[103] Private U.S. companies may also stake claims.[104] These claims are either "unpatented" or "patented" mining claims.[105] A patented mining claim is one for which the United States Federal Government passes its title to the claimant, giving the claimant private ownership of the land and the minerals.[106] Unpatented mining claims give mineral possessory rights to the claimant if minerals are discovered, but the claims do not convey land.[107] After 1994, the United States Congress imposed a moratorium on any new mineral patent applications, leaving unpatented mining claims as the primary method for acquiring new mining rights.[108] Under an unpatented mining claim, active work must continue yearly, or the land will revert to the public domain.[109] The General Mining Law defines active work as at least $100 of labor expended or $100 of improvements made on a yearly basis.[110]

However, when extrapolating, the General Mining Law conflicts with the Outer Space Treaty. The General Mining Law constrains its

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99. Heather Feeney, *Lode & Placer: 150 years of mining claims on public lands*, BUREAU OF LAND MGMT. (May 10, 2022), https://www.blm.gov/blog/2022-05-10/lode-placer-150-years-mining-claims-public-lands.

100. *See General Mining Law of 1872*, BALLOTOPEDIA, https://ballotpedia.org/General_Mining_Law_of_1872 (last visited May 22, 2024).

101. *Id.*

102. *Id.*

103. Christopher J. Reagen & John D. Fognani, *Mining rights and title in USA*, LEXOLOGY (July 4, 2019), https://www.lexology.com/library/detail.aspx?g=4903337f-9524-45e3-84fe-80b5580a830d.

104. *Id.*

105. *Id.*

106. *Resource Brief: Mining Claims*, NAT'L PARK SERV. (Feb. 2015), https://www.nps.gov/sagu/learn/historyculture/upload/Mining-Claims-Brief.pdf.

107. *Id.*

108. Reagen & Fognani, *supra* note 103.

109. Jeff Kohler, *Lesson 2.3: The General Mining Law of 1872 (as amended)*, PENN STATE COLL. EARTH AND MIN. SCIS., https://www.e-education.psu.edu/geog000/node/8 (last visited May 22, 2024).

110. *Id.*

application to public domain lands. Article II of the Outer Space Treaty provides that outer space is not subject to national appropriation. For resource-gathering property rights to vest in a United States entity mining celestial bodies, the United States must have first "retained under federal ownership" the land "as part of the general territory of the United States."[111] As Article II of the Outer Space Treaty prohibits national appropriation, the United States does not have the authority to grant mining claims in outer space in the same fashion as the General Mining Law. Therefore, the General Mining Law does not provide a purely domestic avenue to grant mining rights to private entities in the United States. However, there is a lesson in the method by which the General Mining Law conferred mining rights: an unpatented claim only provides rights in the resources mined on federal land.[112]

A significant point of contention on the international scale comes from compliance with the Outer Space Treaty provision that outer space is "not subject to national appropriation by claim of sovereignty."[113] It is established in the text of the Outer Space Treaty that Articles VI and VIII grant jurisdictional control over space objects to their respective State Parties.[114] Jurisdictional control does not amount to real property rights in space or celestial objects; instead, it provides protection against the loss of ownership of space objects launched or constructed.[115] Put simply, the Outer Space Treaty grants the right for non-governmental entities to bring equipment to mine, and these non-governmental entities do not lose jurisdictional control of the equipment.

Further, by using a grant of mining and mineral rights only and not a grant in the land, similar to an unpatented mining claim, there is an argument that there is no exertion of sovereignty. This argument has sparked general inconsistencies in the interpretation of the Outer Space Treaty and subsequent legislation that has followed.[116] Domestically, an approach similar to the unpatented claims in the General Mining Law looks promising, but as the document currently stands, it does not provide a foolproof avenue for private companies to conduct mining operations in outer space.[117] Given the amount of U.S. corporations operating internationally, a new international regime is needed to give private property rights to reassure these entities. Only then will we see the necessary capital invested to spur privatized space mining.

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111. Kohler, *supra* note 109; Outer Space Treaty, *supra* note 5; *General Mining Law of 1872*, *supra* note 100.

112. Outer Space Treaty, *supra* note 5; Reagen & Fognani, *supra* note 103.

113. Outer Space Treaty, *supra* note 5.

114. *Id*. at art. VI & VIII.

115. Andrew R. Brehm, *Private Property in Outer Space: Establishing a Foundation for Future Exploration*, 33 WIS. INT'L L. J. 353, 360-61 (2015).

116. *See generally id.* ("…[O]ne interpretation of the Outer Space Treaty holds that any allocation of private property rights, including allocation based on jurisdiction and peaceful use, would amount to a national appropriation.").

117. *See General Mining Law of 1872, supra* note 100.

IV. A NEW TREATY AND REGULATORY BODIES REGIME

A. New Multilateral Treaties

How will these property rights vest? Wayne White proposes a multilateral treaty governing property rights in space and argues that Article VIII of the Outer Space Treaty expressly authorizes jurisdictional sovereignty over space objects.[118] White uses this authorization of jurisdictional sovereignty as a vehicle for further property rights.[119] When proposing legislation to govern space mining, it is important to delineate between property rights on the surface of the body being mined and property rights in the resources themselves.

White discusses the property rights that would spawn from the treaty in paragraph 11 of his proposal.[120] White's treaty provides that each nation signatory retains jurisdiction and control over the space objects on its registry, limited safety zones surrounding these objects and facilities, and formal recognition of "real property rights" in private entities if they "inhabit, maintain and/or operate a space facility for a period of at least one year."[121]

These "real property rights" include the right to exclude persons and legal entities from the facilities, the right to be free from interference, the right to control activities within the facility, the exclusive right to appropriate resources within the space facility, and the right to sell the real property rights.[122] These rights are contingent upon the consistent use of the facilities to prevent a State from staking a claim and then maintaining property rights in perpetuity.[123] It would, effectively, permit private property rights in outer space only after an entity has made effective use of the property and continued to do so in a way that allows for free and open use of outer space.[124]

Brehm outlines several advantages that a proposal such as White's would bring. First, this system would incentivize those already in space exploration by expanding their ability to obtain real property rights.[125] Second, this system would create legal certainty in two ways: (i) it would clarify the ambiguity in the Outer Space Treaty, and (ii) it would legally guarantee several valuable property rights and protections for private

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118. Brehm, *supra* note 115, at 367.

119. *Id.* at 368.

120. Wayne White, *Proposal for a Multilateral Treaty Regarding Jurisdiction and Real Property Rights in Outer Space*, SPACE FUTURE, https://web.archive.org/web/20221119145410/https://www.spacefuture.com/archive/proposal_for_a_multilateral_treaty_regarding_jurisdiction_and_real_property_rights_in_outer_space.shtml (last visited Feb. 16, 2024).

121. *Id.*

122. Brehm, *supra* note 115, at 368.

123. *Id.*

124. *Id.*

125. *Id.* at 368–69.

spacefaring entities.[126] Third, it provides a limit on private property rights, which encourages and facilitates free and peaceful use and exploration of space.[127] Fourth, a proposal such as White's would be advantageous to non-spacefaring countries, as it allows for the alienation of these property rights.[128] Fifth, this proposal has great precedential value for future treaties and legislation on outer space mining.[129]

New multilateral treaties could pave the way for the necessary upfront costs of developing a space mining economy. These new treaties do not necessarily need to be the final set of legislation concerning space mining. A treaty such as White's provides a framework for space mining that can later be expanded upon once the mining is underway. Space mining is a new venture, and arguably, neither States nor private entities have the requisite experience to define a comprehensive regime to govern these ventures. Instead, emphasis should be placed on the United States getting its foot in the door and giving that initial incentive to spur future innovation. This sentiment is echoed by some scholars who argue that a final set of legislation is not necessary initially and advocate for a soft law system instead.[130]

A soft law approach would center around the notion that countries could develop a set of evolving laws based on best practices in an industry that humankind is nearly entirely new to.[131] Such an approach could borrow from an unpatented mining claim outlined by the General Mining Law, which would confer rights only to the resources.[132] Private property rights in the area surrounding these mining operations could then be implemented under a proposal such as White's, where rights are contingent on maintaining efficient use of the land.[133] Should an international body be responsible for granting these unpatented mining claims and the resulting property rights?

B. Potential Pitfalls with a New Regulatory Body

There are primarily two competing schools of thought for governing areas beyond national jurisdiction: a top-down approach and a bottom-up approach.[134] A top-down approach favors an international

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126. *Id.* at 369.
127. *Id.*
128. *Id*. at 370.
129. *Id.* at 371.
130. *See* Byrd, *supra* note 87, at 830–32.
131. *Id*. at 831, 834.
132. *See General Mining Law of 1872*, *supra* note 100.
133. *See* White, *supra* note 120.
134. Mark T. Imperial, *Implementation Structures: The Use of Top-Down and Bottom-Up Approaches to Policy Implementation*, OXFORD RSCH. ENCYCLOPEDIA (Jun. 28, 2021), https://oxfordre.com/politics/display/10.1093/acrefore/9780190228637.001.0001/acrefore-9780190228637-e-1750.

regulatory authority that mandates rules through the careful specifications of procedures.[135] When analogizing to space mining, the closest existing example of a regulatory body that would oversee such initiatives is the International Seabed Authority.[136] The ISA has been primarily deemed a failure.[137] The current ISA model took nearly 30 years to develop and come into force.[138] Further, in its operation, it has yet to produce resource mining of the seabed.[139]

Conversely, a bottom-up approach allows policy to be adapted at the local institutional level.[140] The United States has had success with a bottom-up approach to seabed mining in the form of customary international law (CIL). In 1945, President Truman issued an executive order declaring that the United States owned the resources on the continental shelf contiguous to the United States.[141] Other nation-states soon followed suit, and within five years, thirty other coastal states made similar proclamations.[142] This bottom-up framework set out by Truman led to CIL within five years, was codified in thirteen, and still contributes to millions of jobs and billions of dollars annually.[143]

This bottom-up approach is more consistent with U.S. sentiment that is hesitant to submit to any international authority out of respect for U.S. interests.[144] But, this approach is not as easy to implement in outer space. The Truman Proclamation related to the continental shelf adjacent to the United States—a much easier extension of territory than outer space.[145] Further, not every country is spacefaring. These coastal countries that followed suit had access to their seabed. Non-spacefaring nations may feel disadvantaged or even slighted if spacefaring countries were to take this approach.

V. SOLUTION

There is no single solution to governing extraterrestrial mining. It must be a multi-faceted approach. The current legal framework is unworkable and has led to several interpretations from many experts from different States. The Outer Space Treaty, as it stands, gives no

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135. *Id*.

136. UNCLOS, *supra* note 49, at 81.

137. *See generally* Alfred B. Anzaldúa & Cristin Finnigan, *From the Truman Proclamation to the Artemis Accords: Steps Toward Establishing a Bottom-Up Framework for Governance in Space*, SPACE REV. (Oct. 26, 2020), https://www.thespacereview.com/article/4053/1.

138. *Id.*

139. *Id.*

140. *See* Imperial, *supra* note 134.

141. *See* Anzaldúa & Finnigan, *supra* note 137.

142. *Id.*

143. *Id*.

144. *See generally* Wahal, *supra* note 85 ("The United States consistently prioritizes its perceived national interests over international cooperation, opting not to ratify to protect the rights of U.S. businesses or safeguard the government's freedom to act on national security.").

145. Anzaldúa & Finnigan, *supra* note 135.

explicit authorization for private entities to mine in space. But there is no explicit bar on privatized mining either. States that argue that the treaty does not permit private mining inaccurately claim it would be an exercise of sovereignty. On the other hand, States that claim it does permit private mining argue that the treaty's lack of an express renouncement is an implied grant to mine.

While the United States possesses the requisite intent to get private entities into space, as illustrated in the SPACE Act and the Artemis Accords, this legislation does little on the international stage. The number of State Parties to the Artemis Accords is small compared to the number of signatories to the Outer Space Treaty. Further, this approach has upset spacefaring nations such as China and Russia.

The prevailing theme here is that every country wants to participate in this mining if other States are also mining. States will condemn the U.S.' actions by claiming it is a violation of the Outer Space Treaty but they will still pursue private space mining with the companies located inside their borders.

For these reasons, a new set of multilateral treaties must be created to govern extraterrestrial mining. Given the hesitancy of the United States to enter into international treaties, U.S. acceptance of these treaties will likely hinge on how much involvement the U.S. has in drafting them and how favorable they are to U.S. policies. Unfortunately, pro-U.S. sentiment may pose a significant burden when attempting to get States like Russia and China to sign such a treaty. But, if enough parties adopt this treaty through a forum such as the U.N., it may be enough to bring these hesitant States to the table as they do not want to disadvantage themselves.

This treaty should emphasize the alienability of property rights, similar to the treaty proposed by White, so companies in non-spacefaring States are given a chance to participate. Further, the treaty should only confer these rights if there is productive use of the land; this will be useful to curb States' worries that powerful State companies will oversaturate extraterrestrial land by staking a claim and leaving.

States should exercise caution when establishing regulatory bodies to oversee new mining operations and the mining process. Using a bottom-up rather than a top-down approach to conferring mining rights will be important to avoid the pitfalls that made the International Seabed Authority a failure, with its slow movement and lack of transparency. It is essential to spur confidence in these private entities to mine, and inspiring private entities to invest the necessary capital to reach outer space will be pivotal in encouraging others to follow suit. Once the mining is conducted, subsequent treaties and CIL should guide the mining operations to ensure they are both properly zoned and done in a way that minimally impacts the environment of the celestial body. One day, forming an overarching regulatory body to oversee the

operations may be wise. However, creating such a body too soon and imposing stringent guidelines may chill potential attempts for innovation. If regulatory bodies are established, it would be better to do so on a regional level similar to RFMOs.

Given this growing interest in developing the means to mine in outer space, developing a working framework to guide this industry is more imperative than ever. The framework of the Outer Space Treaty and subsequent legislation do not give private entities the proper reassurance in their resource rights that the entities need to spur on these mining operations. As such, States should look to the successes of previous treaties and legislation related to outer space to pass new treaties that establish a clearer system of alienable resource-gathering property rights and use a bottom-up governance approach to adapt to unforeseeable scenarios in this new industry.