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# Commercialization of Resource Extraction Throughout the Final Frontier & the Parallel to Terrestrial Procedures

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## Abstract

How will international law advance with the increasing desire to explore and profit from commercial activities in outer space? Commercialization of mining procedures on extraterrestrial bodies has the potential to be a proverbial well of income, but international law is seemingly ill-equipped to handle the demands of nations looking to profit from this new endeavor. Fortunately for those nations and private entities looking to venture into the final frontier, there may be a solution to the resource extraction dilemma located right here on Earth. Extraterrestrial mining and exploration is facing a Grotian Moment in international law, where analogizing extraterrestrial mining to seabed mining in international waters through the United Nations Convention on the Law of the Sea is the best approach to creating an acceptable long-term solution to resource extraction in outer space.

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## INTRODUCTION

Why does resource extraction in space matter? One important reason is that many people believe that the expansion of individual wealth into the trillions of dollars will be possible only after asteroid mining operations become stable.[1] Therefore, extraterrestrial mining, specifically the mining of asteroids, will likely become the next world-altering commercial activity. These M-type asteroids are the asteroids that would be most profitable when mined for their resources, as they are composed of precious metals such as nickel, iridium, palladium, platinum, gold, magnesium, osmium, ruthenium, and rhodium in copious amounts.[2]

Because these extraction operations are conducted on extraterrestrial bodies, precedents in international law on Earth may be insufficient to effectively govern operations in outer space. Fortunately, the United Nations has already constructed a small body of law for the governance of states, nations, and private

1. Matthew S. Williams, *Asteroid Mining to Shape the Future of Our Wealth*, INTERESTING ENG'G (Nov. 6, 2020), https://interestingengineering.com/asteroid-mining-to-shape-the-future-of-our-wealth [https://perma.cc/6N6H-NFF8]. Asteroids can be divided into three main groups: C-type, S-type, and M-type, which correspond to asteroids composed, respectively, mostly of clay and silicates, silicates and nickel-iron, and metals. About 75% of all asteroids are C-type; while S-types account for around 17%; and M-type and various other unsubstantially populated types make up the remainder. *Id.*

2. Nancy Atkinson, *What Are Asteroids Made Of?*, UNIVERSE TODAY (Sep. 12, 2015), https://www.universetoday.com/37425/what-are-asteroids-made-of [https://perma.cc/U9DZ-9CZN]. The platinum group metals are some of the most rare and useful elements on Earth and, in addition to the metals, the elements to create water are present in asteroids and there are indications that asteroids contain water or ice in their interiors, and there is even evidence that water may have flowed on the surface of at least one asteroid. *Id.*

entities in outer space,[3] hereinafter referred to as "space law." Space law is the body of law governing space-related activities including, but not limited to, mining operations, resource extraction, satellite use, research activities, and spaceflight.[4] Space law comprises a variety of international agreements, treaties, conventions, and United Nations General Assembly resolutions as well as rules and regulations of international organizations.[5]

This Note argues that there must be a system in place to grant property rights to States that are extracting resources on extraterrestrial bodies. Additionally, this Note argues that countries should apply legal customs traditionally used in seabed mineral extraction from areas located in international waters as an analogous process to resource extraction operations on these extraterrestrial bodies. Exploitation of seabed minerals in international waters may only be carried out under a contract with an international authority and any declaration would be subject to its rules, regulations, and procedures.[6] This principle could be drawn upon to apply to extraterrestrial bodies; it is based on the United Nations Convention on the Law of the Sea ("UNCLOS"),[7] where contracts can be issued to both public and private mining enterprises, provided they are sponsored by a State party to UNCLOS and meet certain standards of technological and financial capacity.[8] The economic advantages of extraterrestrial mining under an internationally regulated scheme – much like seabed mining – should be manifested in the form of royalties paid to an international governing body and should be shared for the "benefit of mankind as a whole" with

3. *See generally Space Law*, U.N. Off. for Outer Space Affs., https://www.unoosa.org/oosa/en/ourwork/spacelaw/index.html [https://perma.cc/GK6M-2LFU].

4. *Id.*

5. *Id.*

6. Michael Lodge, *The International Seabed Authority and Deep Seabed Mining*, 54 U.N. Chron., May 2017, https://www.un.org/en/chronicle/article/international-seabed-authority-and-deep-seabed-mining [https://perma.cc/Q9BW-ZE2M].

7. *Id.*

8. United Nations Convention on the Law of the Sea art. 143, Dec. 10, 1982, 1833 U.N.T.S. 397.

particular emphasis on the developing countries that similarly lack the technology and capital to carry out seabed mining.[9]

The obvious starting point is delving into the history of space law to gain an understanding of the customary international law and background from the 1960s. Then, an explanation of seabed mining is required to set the stage for a parallel between the similarity of international seabed mining and resource extraction on extraterrestrial objects. The solution for international law is for the United Nations to create an independent organization similar to the International Seabed Authority (the "Authority").[10] This new and necessary international committee would mirror the International Seabed Authority's processes for granting exploratory and extraction grants, where the United Nations can delegate the authority to grant extraterrestrial exploratory and extraction grants to states and private entities.

## I. Factual Background & History

### *A. Evolution of Space Law*

The 1960s were a decade filled with unprecedented breakthroughs related to space exploration, encompassing the space race, the first human in outer space, and the Moon landing.[11] The Cold War, along with the resulting tension between the Soviet Union and United States, motivated both countries to become more technologically advanced and lay claim to the final frontier.[12] Due to the political pressure exerted by the United

9. *Space Law*, *supra* note 3.

10. *See* Lewis Pinault, *Towards a Space Agency: Operational Successes of the International Seabed Authority as Models for Commercial-National Partnering Under an International Space Authority*, *in* Human Governance Beyond Earth: Implications for Freedom, 173, 175-176 (Charles S. Cockell & Douglas A. Vakoch eds., 2015).

11. *See* Associated Press, *Key Dates in History of Space Exploration*, Phys.Org, (Aug. 26, 2012) https://phys.org/news/2012-08-key-dates-history-space-exploration.html [https://perma.cc/Z8XW-NGQT].

12. *See generally Why Was the US More Motivated to Explore Space in the 1960s Than Today?*, Forbes (Apr. 17, 2019, 5:15 p.m.), https://www.forbes.com/sites/quora/2019/04/17/why-was-the-us-more-motivated-to-explore-space-in-the-1960s-than-today/?sh=3f1cd7bc5f18 [https://perma.cc/UX2M-CMHU].

States and Russia during the Cold War, there was a growing concern in the international community that outer space might become another field for intense rivalries between the superpowers or would be left for exploitation by a limited number of countries with the necessary resources.[13]

Because of this, the United Nations realized that there was a need for international cooperation to explore outer space peacefully and effectively for the benefit of mankind.[14] In response, the Committee on the Peaceful Uses of Outer Space ("COPUOS") was created by the United Nations' General Assembly in 1959 for the purpose of governing the exploration and use of space for peace, security, and development, with the intent to benefit mankind.[15] COPUOS was tasked with promoting and analyzing the use of space, along with conducting research on any potential legal or research issues.[16]

With the help of COPUOS's research, the United Nations then promulgated the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies,[17] (the "Outer Space Treaty") which was exhibited for signatures on January 27, 1967 in Moscow, London, and Washington D.C.[18] This treaty was well received, garnering 64 signatures on the day it was presented

13. *COPUOS History*, U.N. Off. for Outer Space Affs., https://www.unoosa.org/oosa/en/ourwork/copuos/history.html [https://perma.cc/3685-ZM67].

14. Since 1959, COPUOS has been advancing the peaceful exploration and use of outer space, maintaining close contacts with governmental and nongovernmental organizations concerned with outer space activities, providing for exchange of information relating to outer space activities and assisting in the study of measures for the promotion of international cooperation in those activities. *Id.*; *see also* Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Preamble, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

15. *Committee on the Peaceful Uses of Outer Space*, U.N. Off. for Outer Space Affs., https://www.unoosa.org/oosa/en/ourwork/copuos/index.html [https://perma.cc/DTE8-8FBC].

16. *Id.*

17. *Id.*

18. Outer Space Treaty, supra note 14.

to the world,[19] with 26 more countries signing the document before 1968.[20] The Outer Space Treaty was adopted on October 10, 1967[21] and is the foundation for current international space law.[22] The document is only 17 articles long and manages to exist as the most important multinational agreement regarding international space law.[23] An even greater international showing of support has come in recent years as the Outer Space Treaty has been ratified by over 100 states and is ratified by every state

19. *See, e.g.*, *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, U.S. Dep't of State, https://2009-2017.state.gov/t/isn/5181.htm [https://perma.cc/8BHW-BAPZ].

20. *Id.*

21. *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, U.N. Off. for Outer Space Affs., https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html [https://perma.cc/P4ML-WXHV] ("The Treaty was opened for signature by the three depository Governments (the Russian Federation, the United Kingdom and the United States of America) in January 1967, and it entered into force in October 1967.").

22. *Id.*

> The Outer Space Treaty provides the basic framework on international space law, including the following principles: the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind; outer space shall be free for exploration and use by all States; outer space is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means; States shall not place nuclear weapons or other weapons of mass destruction in orbit or on celestial bodies or station them in outer space in any other manner; the Moon and other celestial bodies shall be used exclusively for peaceful purposes; astronauts shall be regarded as the envoys of mankind; States shall be responsible for national space activities whether carried out by governmental or non-governmental entities; States shall be liable for damage caused by their space objects; and States shall avoid harmful contamination of space and celestial bodies.

23. *See* Outer Space Treaty, *supra* note 14. It is one of the only documents regarding international space law currently in force.

capable of space exploration.[24] While the Outer Space Treaty is the most important multinational agreement in international space law, it is not the sole governing document for the entire sector. There are four other treaties that make up international space law: the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies,[25] the Convention on Registration of Objects Launched into Outer Space,[26] the Convention on International Liability for Damage Caused by Space Objects,[27] and the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.[28] Essentially, this is the totality of current international space law.

### *B. Space Law for the Future & the Vision for Exploration*

With the Outer Space Treaty surviving over 50 years and currently being the primary basis for outer space law, there may be an inadequacy for future regulatory schemes without some sort of update to either the Outer Space Treaty or international regulatory framework. In May 2019, Jeff Bezos[29] gave a presentation on his, and Blue Origin's,[30] vision for humanity's

24. Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Forty-Eighth Session, U.N. Doc. A/AC. 105/935, at 7 (2009).

25. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 5, 1979, 1363 U.N.T.S. 23002; *see also Committee on the Peaceful Uses of Outer Space*, *supra* note 15.

26. 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.

27. Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187.

28. Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, *opened for signature* Apr. 22, 1968, 19 U.S. T. 7570, 672 U.N.T.S. 119.

29. Kenneth Chang, Jeff Bezos Unveils Blue Origin's Vision for Space, and a Moon Lander, N.Y. Times (May 9, 2019), https://www.nytimes.com/2019/05/09/science/jeff-bezos-moon.html [https://perma.cc/2Z56-4X7D].

30. *About Blue Origin*, Blue Origin, https://www.blueorigin.com/about-blue/ [https://perma.cc/B5LH-W2D6].

future in space.[31] His lofty vision consists of a series of artificial settlements in orbit that would be a suitable habitat for as many as 1 million people per settlement.[32] With billionaires such as Elon Musk,[33] Jeff Bezos, Richard Branson,[34] and others travelling into space for personal and business experiences, as well as an opportunity to benefit humanity,[35] the interest in expansion into space is undoubtedly growing.[36] Companies are already building models for space hotels, and soon there will be an influx of commercial entities landing on the Moon and extracting resources for profit.[37] Scientific discoveries in space are also continuing into the 21st century. In October 2020, the National Aeronautics and Space Administration ("NASA") discovered water on the Moon,

31. *Space Law Is Inadequate for the Boom in Human Activity There*, The Economist (July 18, 2019), https://www.economist.com/international/2019/07/18/space-law-is-inadequate-for-the-boom-in-human-activity-there. [hereinafter Space Law is Inadequate].

32. *Id.*

33. At the time of drafting, Elon Musk is the wealthiest man on Earth, the chief executive of Tesla and SpaceX, and the greatest stakeholder of Twitter. *Bloomberg Billionaire Index: Elon Musk*, Bloomberg, https://www.bloomberg.com/billionaires/profiles/elon-r-musk/?leadSource=uverify%20wall [https://perma.cc/U852-N64U].

34. Michael Sheetz, *Richard Branson Reaches Space on Virgin Galactic Flight*, CNBC (July 12, 2021, 7:19 AM), https://www.cnbc.com/2021/07/11/richard-branson-reaches-space-on-virgin-galactic-flight.html [https://perma.cc/B9TR-F9HB].

35. Giovanni Bignami & Andrea Sommariva, The Future of Human Space Exploration 2 (2016) ("Many think of scientific research as space exploration's main goal. They are losing sight of other equally important goals: those of an economic, commercial, or cultural nature. And, in longer term, spreading out into space may perhaps guarantee the survival of the human race.").

36. Christian Davenport, *Elon Musk Is Dominating the Space Race. Jeff Bezos Is Trying to Fight Back.*, Wash. Post (Sept. 10, 2021, 6:00 AM) https://www.washingtonpost.com/technology/2021/09-10/musk-bezos-space-rivalry/ [https://perma.cc/S4XF-K5V7] (discussing that Elon Musk and Jeff Bezos are "waging a war" over the race to build an empire in space).

37. Deanna Paul, *Space: The Final Legal Frontier*, Wash. Post (Aug. 31, 2019, 8:00 AM) https://www.washingtonpost.com/technology/2019/08/31/space-final-legal-frontier/ [https://perma.cc/FSN7-S7R9].

raising the public's expectations in the idea that the Moon could be used as a future base of operations for space exploration or a potential colony.[38] The current regulatory framework assumes that space will be managed by states, not private entities, and there are gaps that need to be filled to allow for advancement in space.[39]

One important provision of the Outer Space Treaty states that nations must be held responsible for their actions in space, including those actions resulting from non-governmental activities.[40] This clause essentially means that countries must oversee whatever the private sector does in space. Furthermore, it implies that countries can be held liable by the United Nations Committee on the Peaceful Uses of Outer Space for the actions of commercial and private-sector companies incorporated in their territory if they fail to adhere to the covenants in the Outer Space Treaty or outright refuse compliance. Countries are facing increasing difficulty being compliant with Article VI of the Outer Space Treaty because space commercialization is becoming more advanced every day, and private entities in their jurisdiction such as Moon Express and Bigelow Aerospace are moving forward quickly to pursue commercial opportunities in space.[41] With the interests of individuals, private entities, and even states being piqued by the prospect of advancing their ventures into space and reaping its rewards, space law will have to adjust in the future to accommodate these desires.

38. Donald R. Rothwell, *Bringing Space Law Into the 21st Century*, The Interpreter (Dec. 15, 2020), https://www.lowyinstitute.org/the-interpreter/bringing-space-law-21st-century [https://perma.cc/GWU3-KV2P].

39. *See Space Law Is Inadequate*, *supra* note 31.

40. *See* Loren Grush, *How an International Treaty Signed 50 Years Ago Became the Backbone for Space Law*, The Verge (Jan. 27, 2017, 11:14 AM), https://www.theverge.com/2017/1/27/14398492/outer-space-treaty-50-anniversary-exploration-guidelines [https://perma.cc/6CG5-Y2PJ]; *see also* Outer Space Treaty, *supra* note 14, art. VI ("States Parties to the Treaty shall bear international responsibility for national activities in outer space, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty.").

41. Grush, *supra* note 40.

The Artemis Accords[42] are a useful starting point to begin an analysis on the future of international space law. The Artemis Accords were drafted by NASA and the Department of Defense to promote international cooperation in space and to see the next group of humans on the Moon by 2024.[43] NASA plans to implement the Artemis Accords' mission by "establish[ing] a common vision via a practical set of principles, guidelines, and best practices to enhance the governance of the civil exploration and use of outer space,"[44] and by "creat[ing] a safe and transparent environment which facilitates exploration, science, and commercial activities for all of humanity to enjoy" in the future.[45] 11 countries have signed the Artemis Accords,[46] and there are only 13 space-faring countries with an established space program in 2022.[47] This excerpt from the Artemis Accords[48] is NASA's way of securing interest from other space-faring nations to travel into space once again and it reiterates the idea that space shall be used for civil exploration that will benefit all parties involved. Seeing this, an inference can be made that NASA is supporting a change in international space law by indirectly

42. 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] [https://perma.cc/5K48-DJTR].

43. Almudena Azcárate Ortega, *Artemis Accords: A Step Toward International Cooperation or Further Competition?*, Lawfare (Dec. 15, 2020, 10:25 AM), https://www.lawfareblog.com/artemis-accords-step-toward-international-cooperation-or-further-competition. [https://perma.cc/3PND-3S76].

44. Artemis Accords, *supra* note 42, §1.

45. *The Artemis Accords: Principles for a Safe, Peaceful, and Prosperous Future*, NASA, https://www.nasa.gov/specials/artemis-accords/index.html [https://perma.cc/C3HD-S8X6].

46. Rajeswari Pillai Rajagopalan, *The Artemis Accords and Global Lunar Governance*, Observer Rsch. Found. (June 8, 2021), https://www.orfonline.org/research/the-artemis-accords-and-global-lunar-governance/ [https://perma.cc/6GAL-BM2J].

47. *Countries with Space Programs 2022*, World Population Rev., https://worldpopulationreview.com/country-rankings/countries-with-space-programs [https://perma.cc/HQ5V-HVWM].

48. Artemis Accords, *supra* note 42.

showing the United Nations and non-signing countries that the United States is ready for a push into brand-new space law.

Of course, the Artemis Accords are not infallible, nor are they the sole solution for the advancement of space law. The Artemis Accords have not yet been signed by some of the U.S.'s main allies – Germany and France – which could evidence an unfavorable political climate for signing the Artemis Accords or an environment that simply favors bilateral agreements over multilateral treaties.[49] Therefore, to foster an environment where States do not forego multilateral treaties in favor of agreements only with allies or like-minded states, more regulation surrounding space law must be created.[50]

Outer space is a complicated area, both in terms of scientific complexity and the abstract nature that makes application of international law difficult. These abstract concepts and complexity are similar to international law on the High Seas,[51] and the application of international law through the Authority is a great point to start an analysis on how to tackle the issues surrounding law in space.

### *C. Background of Seabed Mining*

The beginning of the United States' and United Nations' involvement in international seabed law began with President Harry Truman's 1945 proclamation concerning the continental shelf, when the United States asserted jurisdiction and control over the natural resources of the continental shelf, recognizing the shelf as a natural extension of United States territorial lands and therefore under United States' control.[52] Shortly thereafter, as the

49. *See* Jack Wright Nelson, *The Artemis Accords and the Future of International Space Law*, Am. Soc'y Int'l L. Insights, Dec. 10, 2020, at 1, 5.

50. *See id.* ("The ultimate result could be a 'fracturing' of the Moon along legal lines, with different states operating under different rules.").

51. Jason Krause, *The Outer Space Treaty Turns 50. Can It Survive Another Space Race?*, Am. Bar Ass'n (Apr. 1, 2017, 5:00 AM), https://www.abajournal.com/magazine/article/outer_space_treaty [https://perma.cc/VWT5-B3XG].

52. U.S. President Harry S. Truman's September 28, 1945 executive order proclaimed that the resources on the continental shelf contiguous to the United States belonged to the United States. This was a radical departure from the existing international approach

need for a comprehensive legal framework became more apparent, the United Nations held its first Conference on the Law of the Sea in 1956, which resulted in four conventions: the 1958 Convention on the Territorial Sea and Contiguous Zone,[53] the 1958 Convention on the Continental Shelf,[54] the 1958 Convention on the High Seas,[55] and the 1958 Convention on Fishing and Conservation of Living Resources of the High Seas.[56] A second Conference on the Law of the Sea was held in 1960 but did not produce any treaty or agreement.[57] A third and final United Nations conference was called in 1973 to address certain unresolved issues.[58] This conference was concluded in Montego Bay, Jamaica in 1982,[59] and resulted in promulgation of the UNCLOS in 1982.[60] An amendment to the UNCLOS came into

supported by the United Nations, under which the two basic principles of the law of the sea had been a narrow strip of coastal waters under the exclusive sovereignty of the coastal state and an unregulated area beyond that known as the high seas. Michael P. Scharf, Customary International Law in Times of Fundamental Change: Recognizing Grotian Moments 107 (2013); *see also The United Nations Convention on the Law of the Sea (A Historical Perspective)*, U.N., https://www.un.org/depts/los/convention_agreements/convention_historical_perspective.htm [https://perma.cc/725N-EDMU].

53. *See generally* Convention on the Territorial Sea and the Contiguous Zone, Apr. 29, 1958, 516 U.N.T.S. 205.

54. *See generally* Convention on the Continental Shelf, Apr. 29, 1958, 499 U.N.T.S. 311.

55. *See generally* Convention on the High Seas, Apr. 29, 1958, 450 U.N.T.S. 11.

56. *See generally* Convention on Fishing and Conservation of the Living Resources of the High Seas, Apr. 29, 1958, 559 U.N.T.S. 285; *Law of the Sea Convention*, NOAA Off. Gen. Couns., https://www.gc.noaa.gov/gcil_los.html [https://perma.cc/4KRE-K97U].

57. *Law of the Sea Convention*, *supra* note 56.

58. *Id.*

59. John King Gamble, Jr. & Maria Frankowska, *The Significance of Signature to the 1982 Montego Bay Convention on the Law of the Sea*, 14 Ocean Dev. & Int'l L. 121, 122 (1984) ("On December 10, 1982, in Montego Bay, Jamaica, 117 states signed a new and comprehensive Law of the Sea Convention . . . ").

60. *Law of the Sea Convention*, *supra* note 56.

force in 1994 after receiving enough signatures from supporting countries.[61]

The UNCLOS purports to lay down a comprehensive regime of law and regulations regarding use of the world's oceans and seas and resources.[62] The UNCLOS recognizes that the area of the seabed and ocean floor of the high seas are the "common heritage of mankind, the exploration and exploitation of which shall be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States[.]"[63] The UNCLOS achieves this by defining coastal and maritime boundaries, regulating seabed exploration not within a state's territorial bounds, and distributing revenue from regulated explorations.[64] Currently, commercial interest in seabed mining is focused on different types of marine mineral deposits, with polymetallic nodules being the most sought after.[65] Polymetallic nodules occur throughout the ocean and are found lying on the sea floor in the abyssal plains, often partially buried in fine grain sediments.[66] Nodules contain a wide variety of metals, including manganese, iron, copper, nickel, cobalt, lead and zinc, with important, but minor, concentrations of molybdenum, lithium, titanium, and niobium, among others.[67] Private entities may contract to acquire minerals for a certain amount of time, but overall, these materials should be used to benefit mankind and those countries that do not have the technology to mine in international waters themselves.[68] The

61. *Id.*

62. *United Nations Convention on the Law of the Sea of 10 December 1982: Overview and Full Text*, U.N., https://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm (Apr. 11, 2022) [https://perma.cc/78N6-L24R].

63. United Nations Convention on the Law of the Sea, *supra* note 8, at Preamble.

64. Rongxing Guo, Cross-Border Resource Management 429-450 (4th ed. 2021).

65. *Polymetallic nodules*, MIDAS, https://www.eu-midas.net/science/nodules [https://perma.cc/8EQZ-M88E].

66. Lodge, *supra* note 6 ("The most studied area of commercial interest is the Clarion-Clipperton Zone (CCZ) in the eastern Pacific, at water depths between 3,500 and 5,500 metres.").

67. *Id.*

68. *Id.*

Convention on the Law of the Sea directly states: "Activities in the Area shall be organized, carried out and controlled by the Authority on behalf of mankind as a whole in accordance with this article as well as other relevant provisions of this Part and the relevant Annexes, and the rules, regulations and procedures of the Authority."[69]

Furthermore, the UNCLOS establishes the International Seabed Authority (the "Authority").[70] The Authority is the organization through which parties to the Convention organize and control activities in the high seas and around the international seabed, particularly to administer the resources found during international seabed mining activities.[71] This International Seabed Authority was set up to manage the exploitation of the international seabed and its resources beyond a State's territorial limits to prevent a free-for-all and has so far only issued licenses for exploration.[72] The first permits for exploitation have already been granted to both state-sponsored and private entities.[73] The use of resources for the common heritage and benefit of mankind provided for in the UNCLOS carries over into the Authority's mission; it is not only responsible for protecting the seabed in international waters but also for ensuring a fair and equitable allocation of the proceeds from any economic activity conducted on the seabed.[74]

As stated above, the Authority has the power to regulate deep sea activities and grant contracts for exploration and mining, but the process to securing a permit is not clearly

69. United Nations Convention on the Law of the Sea, *supra* note 8, at 78.

70. *See id.* at 81.

71. *Id.* at 81-84.

72. David Shukman, *Deep Sea Mining Licences Issued*, BBC (July 23, 2014), https://www.bbc.com/news/science-environment-28442640 [https://perma.cc/285X-8WTY].

73. *See, e.g.*, *Exploration Contracts*, Int'l Seaboard Auth., https://www.isa.org.jm/exploration-contracts [https://perma.cc/EM5J-4QK4].

74. *International Seaboard Authority Under Pressure Over Deep-Sea Mining Impacts*, Economist Impact (Aug. 15, 2019), https://ocean.economist.com/governance/articles/international-seabed-authority-under-pressure-over-deep-sea-mining-impacts [https://perma.cc/8VLY-NLBV].

defined.[75] Private contractors and state actors may contact the Authority directly to negotiate a contract for exploration of the seabed, and a permit will presumably be granted upon favorable terms for both parties.[76] The Authority will grant contracts to those states or private entities that have the technical capability, available funding, and details on the location and amount of resources to be mined or explored.[77] After a state or private entity has secured a permit to explore the seabed in international waters, but prior to the commencement of an entity's program of activities under the contract, each entity or actor is required to submit to the Authority's Secretary-General a contingency plan for potential incidents arising from its activities in the exploration area.[78] These requirements are amorphous in nature, but the

75. Andrew Johnson, *A Deep Dive Into Private Governance of Deep-Sea Mining*, 24 Vand. J. Ent & Tech. L. 595, 595 (2022)("The International Seabed Authority (ISA) is authorized under the United Nations Convention on the Law of the Sea (UNCLOS) to permit and regulate deep-sea mining…and the ISA is currently developing regulations to issue the first contract allowing deep-sea mining. Deep-sea ecosystems are, however, understudied, and their functioning, diversity, sensitivity, and value are poorly understood. As a result, the initial ISA regulations—intended to protect deep-sea ecosystems—may not effectively address all environmental harms associated with mining in these environments.").

76. *See* Alberto Pecoraro, *UNCLOS and Investor Claims for Deep Sea Mining in the Area: An Investment Law of the Sea?* 6 (Glasgow Centre for Int'l L. & Sec., Working Paper No. 5, 2020), https://gcils.org/wp-content/uploads/2020/11/GCILS-WP-2020-Paper-5-Pecoraro-Revised.pdf; *see also* United Nations Convention on the Law of the Sea, *supra* note 8, at 72.

77. States or private entities "must have spent an amount equivalent to at least U.S. $30 million in research and exploration activities and no less than ten per cent of that amount in the specific area to be explored." More so, these applications must give sufficient descriptions and data to allow the Authority to make an educated decision on whether to award the contract. Ian Bezpalko, *The Deep Seabed: Customary Law Codified*, 44 Nat. Res. J. 867, 887 (2004); *see also* United Nations Convention on the Law of the Sea, *supra* note 8, at 145-151.

78. *Exploration Contracts*, *supra* note 73 (providing information with what contractors must do before their bid for seabed exploration and/or mining may commence in the high seas).

Authority has awarded contracts to 22 separate entities thus far, found in the table below.[79]

| | | Contracts | | | |
|---|---|---|---|---|---|
| | Contractor | PMN | PMS | CFC | Total |
| 1 | Interoceanmetal Joint Organization | 1 | | | 1 |
| 2 | JSC Yuzhmorgeologiya | 1 | | | 1 |
| 3 | Government of the Republic of Korea | 1 | 1 | 1 | 3 |
| 4 | China Ocean Mineral Resources Research and Development Association | 1 | 1 | 1 | 3 |
| 5 | Deep Ocean Resources Development Co. Ltd. | 1 | | | 1 |
| 6 | Institut francais de recherche pour l'exploitation de la mer | 1 | 1 | | 2 |
| 7 | Government of India | 1 | 1 | | 2 |
| 8 | Federal Institute for Geosciences and Natural Resources | 1 | 1 | | 2 |
| 9 | Nauru Ocean Resources Inc. | 1 | | | 1 |
| 10 | Tonga Offshore Mining Limited | 1 | | | 1 |

79. *Id.* (granting contracts to increasing cohort of private entities sponsored by both developed and developing States parties, including small island developing States such as the Cook Islands, Kiribati, Nauru, Singapore, and Tonga).

| | | | | | |
|---|---|---|---|---|---|
| 11 | Global Sea Mineral Resources NV | 1 | | | 1 |
| 12 | UK Seabed Resources Ltd. | 2 | | | 2 |
| 13 | Marawa Research and Exploration Ltd. | 1 | | | 1 |
| 14 | Ocean Mineral Singapore Pte. Ltd. | 1 | | | 1 |
| 15 | Cook Islands Investment Corporation | 1 | | | 1 |
| 16 | China Minmetals Corporation | 1 | | | 1 |
| 17 | Beijing Pioneer Hi-Tech Development Corporation | 1 | | | 1 |
| 18 | Ministry of Natural Resources and Environment of the Russian Federation | | 1 | 1 | 2 |
| 19 | Government of Poland | | 1 | | 1 |
| 20 | Japan Oil, Gas and Metals National Corporation | | | 1 | 1 |
| 21 | Companhia de Pesquisa de Recursos Minersais S.A. | | | 1 | 1 |
| 22 | Blue Minerals Jamaica Ltd | 1 | | | 1 |
| | | 19 | 7 | 5 | 31 |

Although the UNCLOS has never been ratified by the United States Senate,[80] there are dozens of organizations that support ratification of the UNCLOS, including ExxonMobil, Lockheed Martin, AT&T, the American Bar Association, and many ocean conservancy associations.[81]

Furthermore, there is also strong support for accession to the treaty by many prominent Democratic government officials. This includes Hillary Clinton, Secretary of Defense Leon Panetta, and Chairman of the Joint Chiefs of Staff General Martin Dempsey, each of whom testified in support of U.S. accession to the Convention in a May 2012 hearing of the Senate Foreign Relations Committee.[82] Additionally, Secretary of State John Kerry similarly reiterated support for U.S. accession to the Convention throughout his time in office.[83] Furthermore, in Executive Order 13547, President Barack Obama established the "National Policy for Stewardship of the Ocean, our Coasts and the Great Lakes," and identifies U.S. accession to the UNCLOS as a key priority in implementing this policy.[84]

One potential issue with the UNCLOS, aside from the lack of ratification, is that President Ronald Reagan's comments vilifying the treaty have continued to influence the position of Republican Senators, whose votes are needed to reach the 2/3's vote of the

80. *See Law of the Sea Convention*, U.S. Dep't State, https://www.state.gov/law-of-the-sea-convention/ [https://perma.cc/47DY-E5DU].

81. *Id.*

82. *Law of the Sea Convention*, *supra* note 56; *see also The Law of the Sea Convention (Treaty Doc. 103-39): The U.S. National Securit y and Strategic Imperatives for Ratification: Hearing Before the Committee on Foreign Relations*, 112th Cong. 7, 16, 22 (2012) (statement of Hillary Rodham Clinton, U.S. Secretary of State, Martin E. Dempsey, U.S. Joint Chief of Staff, & Leon E. Panetta, U.S. Secretary of Defense).

83. *Law of the Sea Convention*, *supra* note 56; *see also The Law of the Sea Convention (Treaty Doc. 103-39): The U.S. National Securit y and Strategic Imperatives for Ratification: Hearing Before the Committee on Foreign Relations*, 112th Cong. 1 (2012) (statement of Sen. John F. Kerry).

84. *Law of the Sea Convention*, *supra* note 56; Exec. Order No. 13,547, 3 C.F.R. § 75 (2010).

Senate required for ratification.[85] In a radio address titled "Ocean Mining" on Oct. 10, 1978, Ronald Reagan, before he was President of the United States, opined that "no nat[ional] interest of ours could justify handing sovereign control of two-thirds of the earth's surface over to the Third World."[86] While Ronald Reagan was President, he further opined on the U.S.' involvement in the UNCLOS by saying:

> [i]n the deep seabed mining area, we will seek changes necessary to correct those unacceptable elements and to achieve the goal of a treaty that: will not deter development of any deep seabed mineral resources to meet national and world demand; will assure national access to these resources by current and future qualified entities to enhance U.S. security of supply, to avoid monopolization of the resources by the operating arm of the International Authority, and to promote the economic development of the resources; will provide a decision-making role in the deep seabed regime that fairly reflects and effectively protects the political and economic interests and financial contributions of participating states; will not allow for amendments to come into force without approval of the participating states, including in our case the advice and consent of the Senate; will not set other undesirable precedents for international organizations; and will be likely to receive the advice and consent of the Senate. In this regard, the convention should not contain provisions for the mandatory transfer of private technology and participation by and funding for national liberation movements.[87]

85. Thomas Wright, *Outlaw of the Sea: The Senate Republicans' UNCLOS Blunder*, Brookings Inst. (Aug. 7, 2012), https://www.brookings.edu/articles/outlaw-of-the-sea-the-senate-republicans-unclos-blunder/ [https://perma.cc/J33L-MVP8].

86. William P. Clark, *Reagan and the Law of the Sea*, The Heritage Found. (Oct. 9, 2007), https://www.heritage.org/global-politics/commentary/reagan-and-the-law-the-sea [https://perma.cc/EL8X-CUMB].

87. Former U.S. President Ronald Reagan, Statement on United States Participation in the Third United Nations Conference on the Law of the Sea (Jan. 29, 1982), https://www.jag.navy.mil/organization/documents/Reagan%20statement%20on%20US%20participation%20in%20the%20Third%20United%20Nations%20Conference%20

Responding to these concerns, Ronald Reagan's comments were thought, by many, to have been resolved through the 1994 Amendment to UNCLOS via guaranteeing access by private entities in the U.S. to deep seabed minerals under reasonable terms and conditions.[88] Members of President Ronald Reagan's own cabinet have since testified that he would have supported the UNCLOS now that there has been an amendment that addresses most of the U.S.'s concerns.[89] Deputy Secretary of State John D. Negroponte claims the 1994 Agreement addresses President Reagan's concerns by: deleting some provisions on mandatory technology transfer, ensuring that free-market/capitalist approaches are taken to the management of deep seabed mineral, scaling back the deep seabed mining institutions, guaranteeing the United States a permanent seat on the Council, ensuring that the United States would need to approve the adoption of any amendment to the Part XI provisions and any distribution of deep seabed mining revenues accumulated under the Convention, and recognizing the seabed mining claims already established by U.S. companies and providing equality of access for any future qualified U.S. mining operations.[90]

While President Ronald Reagan's comments might appear to eliminate any chance of the United States becoming a signatory of the UNCLOS, proponents of the treaty have lately taken to portray President Ronald Reagan's concerns as relatively

on%20the%20Law%20of%20the%20Sea.pdf [https://perma.cc/E8GS-62Q3].

88. *The United Nation's Law of the Sea Convention (Treaty Doc. 103-39): Hearings Before the Committee on Foreign Relations*, 110th Cong. 6 (2007) (statement by John D. Negroponte, Deputy U.S. Secretary of State) (of course, the United States has yet to ratify the 1994 Amendment to the UNCLOS).

89. As President Reagan's Secretary of State, George P. Shultz, noted in a letter to Senator Lugar, "[i]t surprises me to learn that opponents of the treaty are invoking President Reagan's name, arguing that he would have opposed ratification despite having succeeded on the deep sea-bed issue. During his administration, with full clearance and support from President Reagan, we made it very clear that we would support ratification if our position on the sea-bed issue were accepted." *Id.* at 3-5 (statement by Senator Richard G. Lugar).

90. *Id.* at 6-9 (statement by John D. Negroponte, Deputy U.S. Secretary of State).

circumscribed.[91] Since President Ronald Reagan voiced his distrust and distaste for the UNCLOS in 1983, individuals such as President Bill Clinton, President George W. Bush, and Legal Adviser to the U.S. Department of State Mr. William Taft have come forward to voice their support for the ratification of the treaty.[92] This obvious approval by recent government executives should be enough to evidence the growing trust and affinity for ratifying the UNCLOS with the 1994 Amendment.

Setting aside the dispute regarding how to distribute and use resources extracted from the deep seabed, two further questions remain: how does the UNCLOS deal with claims or disputes between parties and, more importantly, how will the UNCLOS handle "claim jumping," where a state or entity steals the resources in a particular area granted to another state or entity under this agreement?

First and foremost, states are supposed to refrain from any threat, use of force, or act inconsistent with the principles of international law embodied in the Charter of the United Nations.[93] A state's usurpation of resources in the high seas already claimed by another state through a petition to UNCLOS definitively goes against the principles of the U.N. Charter.[94] In an instance where these principles are violated, the UNCLOS' first line of defense to dispute resolution is to have the parties

91. *Id. But see* Clark, *supra* note 86.

92. *The United Nations Convention on the Law of the Sea*, 108th Cong. 23, 68, 73-74 (2004) (statement of William H. Taft, U.S. Department of State Legal Adviser & John Norton Moore, Professor, University of Virginia Law School).

93. United Nations Convention on the Law of the Sea, *supra* note 8, at 138.

94. Some principles of the U.N. Charter include:

> To maintain international peace and security, and to that end: to take effective collective measures for the prevention and removal of threats to the peace, and for the suppression of acts of aggression or other breaches of the peace, and to bring about by peaceful means, and in conformity with the principles of justice and international law, adjustment or settlement of international disputes or situations which might lead to a breach of the peace; [and t]o develop friendly relations among nations[.]

U.N. Charter art. 1, ¶ 1-2.

settle their grievances between themselves in a peaceful manner.[95] Of course, not every dispute between states will be settled peacefully with both parties considering themselves to be in a better position than they were before the dispute. In anticipation of such friction, the UNCLOS established the International Tribunal on the Law of the Sea ("ITLOS")[96] to handle these heftier disputes.[97]

The ITLOS is an independent judicial body with jurisdiction over all matters concerning the interpretation or application of the UNCLOS, and has jurisdiction through any other agreement, statute, etc. that grants the ITLOS authority.[98] The ITLOS is comprised of 21 independent, elected jurists from different states to ensure fairness and integrity amongst the tribunal.[99] The ITLOS has jurisdiction to hear claims relating to seabed disputes because they are disputes between a State Party concerning "acts or omissions of the State Party alleged to be in violation of this Part XI or the UNCLOS annexes."[100] To come before the ITLOS, a party must submit a written application or a special agreement to the Tribunal on the basis of an agreement between the parties to the dispute.[101] The ITLOS has wide discretion when issuing legally binding decisions,[102] only limited by the requirement to comply with the UNCLOS and other international law.[103]

95. *See* United Nations Convention on the Law of the Sea, *supra* note 8, at 129.

96. *See id.* at 129, 131.

97. *See generally* Rachit Garg, *International Tribunal for the Law of the Sea (ITLOS)*, iPleaders (Aug. 28, 2022), https://blog.ipleaders.in/international-tribunal-for-the-law-of-the-sea-itlos/ [https://perma.cc/4JHF-LZWY].

98. *Id.* at 97-98; *see also Latest News*, Int'l Trib. for the L. of the Sea, https://www.itlos.org/en/main/latest-news/ [https://perma.cc/H85Z-UHDS].

99. United Nations Convention on the Law of the Sea, *supra* note 8, at 178.

100. *Id.* at 97-98.

101. Press off., Int'l Tribunal for the L. of the Sea, International Tribunal for the Law of the Sea 14 (2014).

102. *See* United Nations Convention on the Law of the Sea, *supra* note 8, at 134.

103. *Id.* at 133.

## II. Difficulties with Extraterrestrial Resource Extraction Under Current Theories

How, under the current framework of international law, can states or private entities lay claim to the resources they have mined on extraterrestrial bodies if these resources are subject to be used for the benefit and development of mankind? International law may have set the stage for resource extraction in space, but there is not a large body of law covering actual property rights to those resources aside from passing mentions in treaties. The Outer Space Treaty speaks subtly on the issue of laying claim to outer space and extraterrestrial bodies, stating that "outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, use or occupation, or by any other means."[104] Based on the language of the treaty, whether this article applies to resources extracted by private entities or state actors on extraterrestrial bodies is up for debate.

### *A. Aboriginal Title*

One method of acquiring property rights on extraterrestrial bodies is through the claim of aboriginal title if a country were to claim sovereignty over an extraterrestrial body.[105] On Earth, it is generally accepted that aboriginal title is acquired by "actual, exclusive, and continuous use and occupancy 'for a long time' of the claimed area."[106] However, aboriginal title cannot be used to grant property rights to minerals extracted from other planetary bodies.[107] Currently, appropriation through aboriginal title in these instances violates international treaties even though acquiring resources on these extraterrestrial bodies is not against any treaty.[108]

104. Outer Space Treaty, *supra* note 14, art. 2.

105. Andrew Lintner, *Extraterrestrial Extraction: The International Implications of the Space Resource Exploration and Utilization Act of 2015*, Fletcher F. World Aff., Summer 2016, at 139, 142.

106. Pueblo of Jemez v. United States, 790 F.3d 1143, 1165 (10th Cir. 2015) (quoting Native Vill. of Eyak v. Blank, 688 F.3d 619, 622 (9th Cir. 2012)).

107. Lintner, *supra* note 105, at 153.

108. *Id.*

### *B. Imperialistic Title*

There is no doubt that the Outer Space Treaty forbids sovereign states from claiming ownership or title over extraterrestrial bodies under their flag.[109] The Outer Space Treaty fails to explicitly address the possibility of private individuals or corporations laying claim to areas of extraterrestrial bodies.[110] However, the Outer Space Treaty later proclaims that states are liable for the actions of non-governmental, independent actors.[111] Therefore, it should be apparent that imperialistic title cannot be used to grant property rights to areas of land used in mining activities on extraterrestrial bodies. The international community strongly supports the idea that outer space, including 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."[112]This points to the idea that imperialism has not place in international space law.

The Artemis Accords lend assistance in deciphering what is considered an imperialistic title or an appropriation under current international space law. The signatories of the Artemis Accords have emphasized that extraction and utilization of space resources, or mining or otherwise, including resource recovery 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.[113] It must also comply with other international laws currently in force, and in support of safe and sustainable space activities.[114] More so, the Artemis Accords' signatories reaffirm the principle that the extraction of space

109. Outer Space Treaty, *supra* note 14, art. 2 ("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").

110. *See id.* arts. 1-17.

111. *Id.* art. 6 ("States Parties to the Treaty shall bear international responsibility for national activities in outer space . . . whether such activities are carried [out] by governmental agencies or by non-governmental entities").

112. *Id.* art. 1.

113. Artemis Accords, *supra* note 42, § 10, cl. 2.

114. *Id.*

resources do not inherently constitute national appropriation under Article II of the Outer Space Treaty.[115] As a further commitment to the benefit of humankind and the advancement of international space law, the signatories of the Artemis Accords have directly shown their intention to use their experience under the Artemis Accords to contribute to multilateral efforts to further develop international practices and rules applicable to the extraction and utilization of space resources.[116]

The understanding among the international community appears to be that the extraction of resources from extraterrestrial bodies does not constitute national appropriation under current customary international law. Therefore, laying claim to these resources will not violate the Outer Space Treaty and does not constitute claiming an area of an extraterrestrial body under imperialistic title.

## III. An Unseen Solution: Relating Extraterrestrial Resource Mining to Seabed Mining on Earth

The current regulatory scheme of international space law needs a vast update to match the speed at which technology is progressing, so adopting policies like those found in the UNCLOS could be the breakthrough needed to make outer space adequately regulated internationally. Although the focus regarding resource extraction on extraterrestrial bodies has been mainly on the international community, several states' laws regarding space exploration are astonishingly similar to provisions found in the UNCLOS, whether by design or coincidence. The laws of the United Kingdom parallel the UNCLOS' policies for deep seabed mining licenses closely through the United Kingdom Outer Space Act of 1986.[117] Luxembourg recently adopted the Space Resources Law, allowing property rights to be vested in resources extracted on extraterrestrial bodies like the UNCLOS' grant of property

115. *Id.*

116. *Id.* at cl. 4.

117. *See* Joanne Wheeler, *The Space Law Review: United Kingdom*, The L. Revs. (Dec. 9, 2021), https://thelawreviews.co.uk/title/the-space-law-review/united-kingdom [https://perma.cc/7XB4-QBD5].

rights in deep seabed resources.[118] Finally, the United States' use of the U.S. Commercial Space Launch Competitiveness Act ("Space Launch Act") was passed in 2015.[119] These pieces of legislation serve as evidence that legislators in the world-leading space faring countries are beginning to implement both the Outer Space Treaty's principles and principles found in the UNCLOS in their statutes. For this reason, the most appropriate method to advance the body of international space law would be to analogize deep seabed mining practices to extraterrestrial resource extraction.

The first parallel comes from the Outer Space Treaty, Space Launch Act, and the UNCLOS is a "fair use" provision where any resources that are extracted are to be used for the benefit of mankind. The Space Launch Act was, presumably, not actively written to fall within the letter of the UNCLOS but does so by exclaiming that "by the [promulgation] of this Act, the United States does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body."[120] This provision is equivalent to UNCLOS Article 137's language, stating: "[n]o State shall claim or exercise sovereignty or sovereign rights over any part of the [deep seabed] or its resources, nor shall any State or natural or juridical person appropriate any part thereof."[121] Furthermore, considering there are already over 100 signatories to the Outer Space Treaty,[122] it can be inferred that all space-faring nations are committed to

118. Jeff Foust, *Luxembourg Adopts Space Resources Law*, SpaceNews, (July 17, 2017), https://spacenews.com/luxembourg-adopts-space-resources-law/ ("'Luxembourg is the first adopter in Europe of a legal and regulatory framework recognizing that space resources are capable of being owned by private companies,' Étienne Schneider, deputy prime minister and minister of the economy, said in a statement") [https://perma.cc/7Z2F-QTES].

119. *See* U.S. Commercial Space Launch Competitiveness Act, H.R. 2262, 114th Cong., 129 Stat. 704 (2015).

120. *Id.* § 403.

121. United Nations Convention on the Law of the Sea, *supra* note 8, at 70.

122. *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, U.N. Off. For Disarmament Affs., https://treaties.unoda.org/t/outer_space [https://perma.cc/D4R2-YNTH].

using resources found on extraterrestrial bodies to the benefit of humankind. Therefore, it would not be implausible for states to sign and ratify a new space treaty with a provision like those found in the UNCLOS and Outer Space Treaty.

The strongest showing for implementation of the UNCLOS's principles to international space law comes from the United States' desire to allow private individuals and corporations to lay claim to any resources they extract from extraterrestrial bodies.[123] The United Kingdom does not have an express grant of property rights in any piece of legislation, but the right can be inferred through practices.[124] The United Kingdom is involved in an experiment regarding biomining on the Moon to see whether this is an applicable procedure for resource extraction in outer space.[125] The Outer Space Treaty is silent on individual or corporate resource extraction and property rights,[126] so the parallel to the UNCLOS' permissions to let private entities claim title to resources would perfectly fill this gap. The Space Launch Act directly states; "A United States citizen engaged in commercial recovery of a space resource [ . . . ] shall be entitled to [ . . . ] possess, own, transport, use, [or] sell the space resource obtained in accordance with applicable law, including the international obligations of the United States."[127]

Some scholars and analysts have argued that recognizing property claims would be explicitly prohibited under Article II of the treaty; "[o]uter space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other

123. *See generally* U.S. Commercial Space Launch Competitiveness Act, H.R. 2262, 114th Cong., 129 Stat. 721, § 51302 (2015).

124. *See* Wheeler, *supra* note 117.

125. *UK Space Experiment Could Unlock Mining Resources on Moon and Mars*, Sky News (Dec. 5, 2020, 3:57 AM), https://news.sky.com/story/uk-space-experiment-could-unlock-mining-resources-on-moon-and-mars-12151015 [https://perma.cc/5YZP-PL68].

126. *Space Law – Rights and Resources*, Talks On L., https://www.talksonlaw.com/talks/space-law-rights-and-resources [https://perma.cc/Y4G9-6LNJ].

127. U.S. Commercial Space Launch Competitiveness Act, H.R. 2262, 114th Cong., 129 Stat. 721, § 51303 (2015).

means."[128] As previously mentioned, the Outer Space Treaty includes a provision that states must take responsibility for the actions of private entities that conduct operations in space when the private entity hails from the state in question.[129] This state liability imputed from its non-governmental actors should not be construed as an insurmountable ban on resource extraction even though recognizing ownership rights in materials could be viewed as an appropriation.

Furthermore, another sentence in Article VI hints at the idea that private individuals and entities should be treated differently than states. It reads: "[t]he activities of non-governmental entities in outer space, including the moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty."[130] This sentence is arguably the most helpful in the entire Outer Space Treaty because it can be used to prove that although states cannot appropriate extraterrestrial bodies, there may be an alternative route for private entities to claim resources or land so long as they are promoting the ideals of the Outer Space Treaty. This proposal has advanced because there is an obvious gap in the Outer Space Treaty regarding whether a private individual or entity may have vested property rights in the resources they extract from outer space.[131] The UNCLOS' provisions allowing such acts by private actors[132] should be superimposed onto the Outer Space Treaty through an amendment or redraft of the Outer Space Treaty to

128. Rand Simberg, *Property Rights in Space*, The New Atlantis, https://www.thenewatlantis.com/publications/property-rights-in-space [https://perma.cc/5AB8-32Y6]; *see also* Outer Space Treaty, *supra* note 14, art. 2. During the negotiations of the Outer Space Treaty, the Delegate of Belgium affirmed that his delegation "had taken note of the interpretation of the non-appropriation advanced by several delegations-apparently without contradiction-as covering both the establishment of sovereignty and the creation of titles to property in private law.

129. Outer Space Treaty, *supra* note 14, art. 6 ("States Parties to the Treaty shall bear international responsibility for national activities in outer space . . . whether such activities are carried [out] by governmental agencies or by non-governmental entities").

130. *Id.*

131. *See id.*

132. *See* United Nations Convention on the Law of the Sea, *supra* note 8, at 166-67.

ensure the advancement of humankind can be achieved through the private sector. Of course, the Outer Space Treaty could be suitable for mining on its own without any new regulation in place. This is because even though the non-appropriation principle prohibits states from owning territory on celestial bodies, there is no *per se* issue with extracted resources.[133]

By creating an autonomous international body to oversee and approve or deny mining requests, States will be unable to completely monopolize regions that are bountiful for extraction, nor will States be able to claim territorial rights over extraterrestrial bodies. Other authors have already proposed using an international body to oversee space exploration and property rights regarding extraterrestrial bodies and territories on those bodies.[134] Mitchell Powell, currently an employee at the U.S. Department of Justice, reasoned that space-faring nations must push for the adoption of an international regulatory committee that oversees applications for resource extraction on extraterrestrial bodies.[135] He also reasoned that such an international regulatory committee must issue permits to do so based on a defined process used to govern and protect individuals, businesses, and nations competing to commercialize space through mining and the extraction of space-based resources.[136]

Even though states and private entities may lay claim to the resources they have extracted from extraterrestrial bodies, another point of scrutiny is that neither treaty defines what constitutes a use for the benefit or advancement of humanity.[137] This leaves the term open for interpretation. At a United Nations 4th Committee meeting in 2003, Lebanon's representative essentially defined activities used for the benefit of mankind as advancements in space technology and extraterrestrial resource

133. *See generally* John G. Wrench, *Non-Appropriation, No Problem: The Outer Space Treaty Is Ready for Asteroid Mining*, 51 Case W. Rsrv. J. Int'l L. 437, 437-62 (2019).

134. *See, e.g.*, Mitchell Powell, *Understanding the Promises and Pitfalls of Outer Space Mining and the Need for an International Regulatory Body to Govern the Extraction of Space-Based Resources*, 19 Pitt. J. Tech. L. & Pol'y 1, 35 (2019).

135. *Id.*

136. *Id.*

137. *See* United Nations Convention on the Law of the Sea, *supra* note 8; Outer Spacy Treaty, *supra* note 14.

extraction that are used to craft improvements in the fields of "agriculture, medicine, transportation, weather forecasting[,] and natural disaster planning."[138] To improve the chances of states signing and ratifying this expansion to the Outer Space Treaty, an explanation could be attached separately that elaborates on the fact that states and private entities can use these extracted resources in commercial enterprises or purely for the benefit of the entity. More so, this attached definition could be used to assuage the concerns voiced by President Ronald Reagan and reaffirm that these clauses do not "hand sovereign control of two-thirds of [extracted resources] over to the Third World."[139]

President Ronald Reagan's concerns can be further quelled, and the requirement to use extracted resources for the benefit of mankind can be achieved if the state, individual, or private entity were to pay royalties, like a tax, to the autonomous, governing international body based on the type and amount of resource(s) extracted from extraterrestrial bodies. This would be an amicable solution for both the international community and private entities that wish to extract resources on extraterrestrial bodies because the entity would be able to keep and utilize their extracted resources while the international body would use these royalties to benefit mankind. This body would then be tasked with putting the royalties to use for the benefit of humankind by creating and executing programs that advance the space programs of other countries, such as assisting non-space-faring nations in reaching outer space, conducting research into more efficient rocket propulsion systems, researching the ability to continue exploration onto extraterrestrial bodies, and more.

Akin to the UNCLOS's requirement on parties to submit a petition to receive exploratory and extraction rights to minerals in the deep seabed, several countries have perquisite conditions for extra-planetary extraction.[140] For example, the United Kingdom has implemented a strict set of procedures with which private entities must comply before they are granted a license to

138. Press Release, General Assembly, Using Benefits of Space Science for all Humankind, Avoiding Outer Space Arms Race Stressed in Fourth Committee Debate, U.N. Press Release GA/SPD/269 (Oct. 21, 2003).

139. Clark, *supra* note 86.

140. *See* Wheeler, *supra* note 117; Law on Use of Resources in Space, 2017 (Act No. 674) (Lux.).

even send a spacecraft into outer space.[141] Luxembourg has implemented permit requirements in its Space Resources Law, only allowing corporations or private entities that are public companies with shares on the market, an LLC, or a European company with a registered office in Luxembourg to be eligible to receive a permit.[142] Any such company desiring to go into space is also required to show a "robust scheme of financial, technical and statutory procedures and arrangements through which the exploration and utilization mission, including the commercialization of space resources are planned and implemented."[143] These conditions are already incredibly similar to those found in UNCLOS Annex III, which lists factors such as the length of the mining operation, sponsorship of the home state, and a general description of the equipment and methods to be used in carrying out exploration and mining activities, and any other relevant information about the characteristics of such technology.[144] These examples demonstrate that the international community is already adopting methods of permitting space exploration that neatly parallel the UNCLOS, so the requirements to acquire a seabed mining contract naturally flow into the space sector.

The international regulatory body tasked with authorizing extraterrestrial mining contracts should be as close to what is proposed in the UNCLOS regarding seabed resource extraction, and attorney Ezra Reinstein provides a compelling example of what an international regulatory body would do and how a state, individual, or corporation would acquire mining rights on extraterrestrial bodies.[145] Reinstein's example of an independent regulatory body dubbed the "U.N. Space Exploitation Registry"[146] analyzes all of the factors that the UNCLOS does when deciding who to award exploratory or extraction permits; this includes examining detailed outlines of the process, timing for execution

141. *See* Wheeler, *supra* note 117.

142. Law on Use of Resources in Space art. 4, 2017 (Act No. 674) (Lux.).

143. *Id.* art. 7.

144. United Nations Convention on the Law of the Sea, *supra* note 8, at 147-51.

145. Ezra J. Reinstein, *Owning Outer Space*, 20 Nw. J. Int'l L. & Bus. 59, 85 (1999).

146. *Id.*

of the contract, plans for health and safety concerns, and a determination of what technology will be used.[147] This small description of how a permit could be issued by an international regulatory body is certainly helpful to start. When combined with Luxembourg's descriptive law,[148] the United Kingdom's practices and procedure, along with the UNCLOS' in-depth procedures, space law would have an operable process for awarding resource extraction permits in space.

Therefore, the Outer Space Treaty should be revised to become parallel with the UNCLOS in terms of allowing for both state-sponsored and individualized mining claims or property rights, establishing an independent internationally regulated body to oversee extraction and exploration requests, and overall terms of the treaty. This solution is necessary because the international community is preparing for a "Grotian Moment"[149] in international space law which requires an updated and workable treaty to advance humankind. An amendment to the Outer Space Treaty could follow in the same footsteps as the UNCLOS' 1994 Amendment by addressing these appropriation issues before they arise and removing any consideration of technology sharing to third-world or less capable countries. Such an amendment would allow private entities to send missions into space for resource extraction to promote capitalism and individual advancement, while ensuring that private entities may utilize the resources they have extracted from extraterrestrial bodies. This would then result in a royalty payment to an international governing body to be used for the benefit of humankind. Then, the international governing body – presumably created by the United Nations Office for Outer Space Affairs – could oversee research and resource extraction operations through acquiring detailed financial, scientific, and political data from a state wanting to enter space to decide whether to issue permits while implementing programs that assist mankind in expanding into space.

147. *Id.* 85-87

148. Law on Use of Resources in Space, 2017 (Act No. 674) (Lux.).

149. "Grotian Moment" is a term "that denotes a paradigm-shifting development in which new rules and doctrines of customary international law emerge with unusual rapidity and acceptance." Michael P. Scharf, *The "Grotian Moment" Concept*, 19 Int'l L. Students Ass'n Q. 16; s*ee also* Scharf, *supra* note 52.

## Conclusion

Extraterrestrial mining has the opportunity to become one of the largest sources of revenue moving into the future. This would be the culmination of the international community laying the groundwork for such extraterrestrial mining operations as early as the 1960s. The current requirements for seabed mining serve to be a near-perfect solution to the problem of attributing mining and property rights to States when they engage in mining operations on extraterrestrial bodies.

Although methods of title acquisition have been discussed by works in the past,[150] there has never been a widely accepted or consistent determination of the processes used to grant nations or individuals the rights to mine on extraterrestrial bodies. [151] The question being if a nation, state, or private entity cannot claim the rights to an extraterrestrial body or any area on that object, how would they be able to extract resources and lay claim to those resources? The most workable way to analyze property rights in space is to analogize space law to the UNCLOS due to their similarities regarding the purpose to benefit mankind, the similarity of resources being extracted, and the international cooperation surrounding the extractions.

The best solution for deciding property rights for resources mined on extraterrestrial bodies is to create international law and regulations analogous to those created for international seabed mining. This would foster an environment that focuses on the advancement of scientific research and the benefit of mankind. The international community is already adopting procedures to advance the exploratory availability of outer space.[152] This has been demonstrated by: the United Kingdom passing an act allowing permits to explore space, which implicitly allowed the possibility of property rights from government action,[153] Luxembourg enacting a law that allows space resources to be

150. *See generally* Wrench, *supra* note 133 (describing how imperialistic title and the non-appropriation doctrine already applies to resources mined on extraterrestrial bodies).

151. *See id.* at 448.

152. *See* Wheeler, *supra* note 117; Law on Use of Resources in Space, 2017 (Act No. 674) (Lux.); U.S. Commercial Space Launch Competitiveness Act, H.R. 2262, 114th Cong., 129 Stat. 704 (2015).

153. *See* Wheeler, *supra* note 117.

owned and providing a description of how to acquire a permit,[154] and the United States' Space Launch Act allowing private individuals to retain property rights to resources acquired in space.[155]

Finally, the creation of an international governing body under the United Nations Office for Outer Space Affairs that grants mining or exploratory capabilities to States based on research and resource extraction operations through detailed financial, scientific, and political data from a state would ensure that no State will try to gain territorial rights over mining zones through imperialistic title or via a threat of force. The obligation to use extracted resources for the benefit of humankind found in the current version of the Outer Space Treaty and the UNCLOS could be satisfied by requiring states and private entities to pay a royalty, like a tax, on any of the resources they have extracted from extraterrestrial bodies before utilization and using these funds to strengthen the space-faring ability of the international community.

154. Law on Use of Resources in Space, 2017 (Act No. 674) (Lux.).

155. U.S. Commercial Space Launch Competitiveness Act, H.R. 2262, 114th Cong., 129 Stat. 721, § 51303 (2015).