

MINING FOR MEANING: AN EXAMINATION OF THE LEGALITY OF PROPERTY RIGHTS IN SPACE RESOURCES

*Amanda M. Leon**

In November 2015, the Space Resource Exploration and Utilization Act of 2015 (“SREU Act”) became law. Private space companies hoping to mine asteroids for commercial gain rejoiced. For years, such private companies had struggled to obtain adequate funding and support for their revolutionary space missions due to a lack of legal certainty regarding property rights in space under the vague legal framework of the Outer Space Treaty (“OST”). The SREU Act purportedly eliminated this uncertainty by explicitly granting U.S. citizens property rights in any asteroid or space resource recovered for commercial purposes from space.

Nevertheless, much tension remains between this unilateral grant of property rights and the international obligations of the United States under the OST. This Note concludes that the SREU Act abrogates the United States’ international obligations and that the United States should have initiated discussions at the international level first to champion a more effective and long-lasting multilateral solution. Finally, this Note finds this abrogation to be all for naught, as the law itself fails to achieve its goal of providing the private space industry with the legal certainty it so desires and requires.

I. INTRODUCTION	498
II. BACKGROUND.....	501
A. <i>The Industry</i>	501
B. <i>The Scholarship</i>	508

J.D., University of Virginia School of Law, 2017; Associate, Caplin & Drysdale, Chtd., Washington, D.C. Special thanks to Professor Michael Doran for agreeing to advise on this unique project and providing invaluable guidance along the way; and to the current and previous Notes Development and Executive Editor teams for helping transform this note from a whimsical independent research project into a publishable product. I would also like to thank a local hiker and retired aeronautical engineer in Sedona, Arizona for telling me I should study something innovative instead of old laws and thoughts, and Ryan Kim for asking, “Who owns the Moon?,” after being forced to listen to endless 1L property class anecdotes—and thanks to both for ultimately spurring the idea for this note. *Not licensed to practice in Washington, D.C. (practicing under the direct supervision of a D.C. Bar member).

III. LEGAL FRAMEWORK	514
A. <i>Space Law</i>	514
1. <i>The Outer Space Treaty</i>	514
2. <i>The Moon Agreement</i>	516
3. <i>U.S. Domestic Law</i>	517
4. <i>Analogous Treaties</i>	519
B. <i>Treaty Interpretation Rules</i>	520
1. <i>The Vienna Convention</i>	521
2. <i>Domestic Interpretive Rules</i>	522
3. <i>Further Treaty Interpretation Remarks</i>	522
IV. COMPATIBILITY OF THE SREU ACT WITH INTERNATIONAL OBLIGATIONS	523
A. <i>Determining the United States' International Treaty Obligations Under the Outer Space Treaty</i>	524
1. <i>Ordinary Meaning</i>	526
2. <i>Preparatory Materials</i>	529
3. <i>Historical Context</i>	531
4. <i>State Practice</i>	535
5. <i>State Interpretations</i>	538
B. <i>Compatibility</i>	541
C. <i>Implications</i>	544
V. CONCLUSION	546

I. INTRODUCTION

Several private space companies plan to mine asteroids in outer space to answer mineral and water needs—not to mention make a pretty profit while doing so. Considering that a man has not stepped on the Moon in over forty years, it becomes tempting to dismiss the plan to mine giant rocks in outer space as a pipe dream of the far future. Surprisingly, however, this pipe dream is at least 115 years in the making. By 1903, a self-educated Russian rocket pioneer, Konstantin Eduardovich Tsiolkovsky, had developed a roadmap for successfully expanding mankind into space.¹ Point 12 in his “14 Points” of action read: “exploitation of asteroid resources to achieve autonomy from Earth.”²

¹ John S. Lewis, *Asteroid Mining 101: Wealth for the New Space Economy* 6–7 (David Gump ed., 2015).

² *Id.* at 7.

Over a century later, one must wonder why Point 12 has yet to come to fruition. Many plausible answers come to mind: a lack of government funding, an absence of necessity, a need for more advanced aerospace technology, and a shortage of knowledge regarding the true nature of asteroids. Strikingly, however, many blame another culprit for slowing the revolutionary road to asteroid mining: the law.³ Private companies have long recognized the benefits and profit potential of asteroid mining but, given the unknown, have struggled to raise the capital for such a risky and uncharted venture.⁴ For example, if a venture actually managed to bring resources mined from asteroids back to Earth, would the venture legally “own” the mined resources, or would some government or multinational organization attempt to seize the resources for science?⁵ Without the legal certainty of property rights, the high upfront costs have been an insurmountable barrier to entry. For example, Jim Benson, a retired Washington millionaire and founder of SpaceDev, Inc., was forced to abandon his asteroid mining plans in the late 1990s after finding the venture cost-prohibitive.⁶

At the end of 2015, however, the public and private space community rejoiced as the House and Senate attempted to push legislation through to settle the unknowns once and for all. As put by Representative Kevin McCarthy of California, “[t]his bill will unite law with innovation—

³ For an aptly titled example, see William Herkewitz, *The Biggest Barrier to Asteroid Mining Isn't Technical, It's Legal*, *Popular Mechanics* (Aug. 16, 2016), <http://www.popularmechanics.com/space/deep-space/a22347/asteroid-mining-international-law/> [<https://perma.cc/497E-HFG8>].

⁴ See, e.g., Exploring Our Solar System: The ASTEROIDS Act as a Key Step: Hearing on H.R. 5063 Before the Subcomm. on Space of the H. Comm. on Sci., Space, and Tech., 113th Cong. 13–14 (2014) (statement of Rep. Bill Posey, cosponsor of the bill) (“Today, private companies do not have legal certainty that if they obtain resources from an asteroid that they can own them. The ASTEROIDS Act would provide this certainty to American companies, and companies are empowered to conduct their operations without harmful interference.”).

⁵ Deep Space Industries, a present-day asteroid mining firm, found many potential investors to be “skittish.” Matthew Shaer, *The Asteroid Miner’s Guide to the Galaxy*, *Foreign Policy* (Apr. 28, 2016), <https://foreignpolicy.com/2016/04/28/the-asteroid-miners-guide-to-the-galaxy-space-race-mining-asteroids-planetary-research-deep-space-industries/> [<https://perma.cc/SX5J-F4GW>]. The firm’s general counsel, Sagi Kfir, once said, “People would ask, ‘Well, are you allowed to extract these minerals? Can you guarantee that an outside body’—the United Nations, say—‘isn’t going to shut you down?’” *Id.*

⁶ Benson would not take any government money in an effort to raise awareness about the need to establish private property rights in space. *Id.* “Benson would discover, however, that the hardware and computer chipsets required to get a rocket to an asteroid were costly, even for a millionaire, and he was forced to let go of the mission. . . . Benson moved on to related ventures, including space tourism.” *Id.*

allowing the next generation of pioneers to experiment, learn and succeed without being constrained by premature regulatory action.”⁷ According to Chris Lewicki, President and CEO of a private space-resource-mining company, “[t]his off-planet economy will forever change our lives for the better here on Earth.”⁸ With such promise and upside, the proposed legislation quickly became law in the form of the U.S. Commercial Space Launch Competitiveness Act.⁹ To the space community, President Obama’s signature on November 25, 2015 finally provided the legal certainty and industry-friendly regulatory environment necessary to usher in a new era of space exploration, and in turn benefit mankind greatly.

The new U.S. Commercial Space Launch Competitiveness Act both amended previous law and added several completely new and revolutionary provisions.¹⁰ Media buzz has focused on Title I of the Act, aptly named the “SPACE Act.”¹¹ Nevertheless, Title IV of the Space Resource Exploration and Utilization Act of 2015 (“SREU Act”)¹² actually contains some of the most surprising and revolutionary provisions of the law. The SREU Act entitles any United States citizen to property rights in resources obtained from outer space, including the right to possess, own, transport, use, and sell the resources “in accordance with applicable law, including the international obligations of the United States,” presumably in space and back on Earth.¹³

At first blush, this provision of property rights appears to be a praiseworthy step in the right direction toward giving the legal certainty and incentives necessary for modern-day space exploration and

⁷ Stephen Dinan, *Congress OKs Space Act, Paves Way for Companies to Own Resources Mined from Asteroids*, *Wash. Times* (Nov. 16, 2015), <http://www.washingtontimes.com/news/2015/nov/16/congress-approves-space-act-paves-way-private-comp/> [<https://perma.cc/8KB7-DSL7>].

⁸ *Id.* (quoting Chris Lewicki, CEO, President, and Chief Engineer of Planetary Resources).

⁹ Pub. L. No. 114-90, §§ 101–403, 129 Stat. 704, 704–22 (2015) (to be codified at 51 U.S.C. §§ 10101–51303).

¹⁰ *Id.* § 1(c), 129 Stat. at 704–05 (to be codified at 51 U.S.C. § 10101). See generally, Julie Randolph, *Fly Me to the Moon and Let Me Mine an Asteroid: A Primer on Private Entities’ Rights to Outer Space Resources*, *DRI For Def.* 41, 43 (2017) (discussing the history of U.S. domestic space law).

¹¹ *Spurring Private Aerospace Competitiveness and Entrepreneurship Act of 2015*. *Id.* §§ 101–17, 129 Stat. at 705–18 (to be codified in scattered sections of 51 U.S.C.).

¹² *Id.* §§ 401–03, 129 Stat. at 720–22 (to be codified at 51 U.S.C. §§ 10101, 51301–03).

¹³ *Id.* § 402, 129 Stat. at 721 (to be codified at 51 U.S.C. § 51303).

development to flourish. Nevertheless, upon closer review of the historical landscape of space law, this provision of asteroid- and space-resource rights to U.S. citizens looks more like a hasty unilateral move that ignores the basic tenets of international space law and the treaty obligations of the United States. This Note uses treaty interpretation to determine the United States' international obligations under the Outer Space Treaty ("OST")¹⁴ and then considers the compatibility of the new SREU Act with these obligations. This Note concludes that the SREU Act abrogates the United States' international obligations and argues that Congress should have instead initiated discussions at the international level first. Furthermore, this Note finds that despite its potential for praise as a necessary step in the right direction—both incentivizing private industry and stirring international discussion—the SREU Act lacks a coordinating rule to guide actors in establishing the property rights bestowed upon them. Without such a rule, the SREU Act cannot provide any meaningful legal certainty to private space companies regarding the prospect of mining asteroids in the near future and risks souring international trust.

Part II begins by providing an overview of the private space industry, focusing on resource mining in outer space, its untapped benefits for mankind, and why the property-rights debate matters. Part III lays out the legal framework of both international and domestic "space law." Part IV analyzes whether the OST allows for property rights in space resources; it then considers whether or not the SREU Act complies with the Treaty's obligations, as well as implications of this determination.

II. BACKGROUND

A. The Industry

Asteroid mining's benefits are twofold: the innovative activity provides the potential not only to (1) answer current resource needs on Earth either by supplementing current mining efforts or by replacing Earth mining altogether to preserve the fragile environment, but also to (2) provide the resources necessary to make historic deep-space missions a possibility. Over a century in the making, asteroid mining's

¹⁴ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

potentials and possibilities are quickly becoming realities and must be given the legal landscape to flourish.

The call for the development of the legal landscape comes amidst promising advances in asteroid mining technology. Two private companies in the United States currently have plans to mine asteroids by 2020 to 2025.¹⁵ Planetary Resources boasts founding investors including Larry Page, Eric Schmidt, and Ram Shriram of Google fame, Virgin Group founder Richard Branson, and Ross Perot, Jr.¹⁶ The company's President and CEO, Chris Lewicki, previously served in pivotal roles at NASA during the Mars Exploration Rovers and Phoenix Mars Lander missions.¹⁷ With such a robust team and coffers, the company has already achieved a significant milestone: in 2015, Planetary Resources successfully deployed its first spacecraft from the International Space Station, a crucial first step to testing asteroid-prospecting technology in orbit.¹⁸ On January 12, 2018, the group successfully launched Arkyd-6, a spacecraft with the technology to detect water resources in outer space.¹⁹ The spacecraft is now in orbit.²⁰ Further, the group plans to launch multiple spacecrafts to "a pre-determined target asteroid to collect data and test material samples."²¹ Silicon Valley-based Deep Space Industries

¹⁵ Fabio Tronchetti, *The Space Resource Exploration and Utilization Act: A Move Forward or a Step Back?*, 34 *Space Policy* 6, 6 (2015) (citing generally to the websites of Planetary Resources and Deep Space Industries).

¹⁶ Planetary Resources, *The Company: Team*, <http://www.planetaryresources.com/company/#team> [https://perma.cc/2GMS-E7NH] (last visited Jan. 17, 2018).

¹⁷ Planetary Resources, *The Company: Team: Chris Lewicki*, <http://www.planetaryresources.com/team/chris-lewicki/> [https://perma.cc/U5VN-EFGT] (last visited Jan. 17, 2018).

¹⁸ Press Release, Planetary Resources, *Planetary Resources' First Spacecraft Successfully Deployed, Testing Asteroid Prospecting Technology on Orbit* (July 16, 2015), <http://www.planetaryresources.com/2015/07/planetary-resources-first-spacecraft-deployed/> [https://perma.cc/5XU8-9R99].

¹⁹ Press Release, Planetary Resources, *Planetary Resources Launches Latest Spacecraft in Advance of Space Resource Exploration Mission* (Jan. 12, 2018), <https://www.planetaryresources.com/2018/01/planetary-resources-launches-latest-spacecraft-in-advance-of-space-resource-exploration-mission/> [https://perma.cc/R9CL-AZPG].

²⁰ Press Release, Planetary Resources, *Arkyd-6 is in Orbit!* (January 25, 2018), <https://www.planetaryresources.com/2018/01/arkyd-6-is-in-orbit/> [https://perma.cc/4Q6E-89QG].

²¹ Planetary Resources, *Arkyd-301: About the Exploration Program*, <https://www.planetaryresources.com/missions/arkyd-301/> [https://perma.cc/V43Y-G8P7] (last visited Feb. 3, 2018).

shares similar aspirations to mine asteroids.²² The company envisions itself “changing the economics of the space industry by providing the technical resources, capabilities and system integration required to prospect for, harvest, process, manufacture and market in-space resources.”²³ Deep Space Industries has yet to launch its own spacecraft, but has partnered with the Luxembourg Government and Société Nationale de Crédit et d’Investissement to develop Prospector-X to test its innovative deep-space technology.²⁴ Deep Space Industries has also announced plans “to fly the world’s first commercial interplanetary mining mission.”²⁵ Its Prospector-1 “will fly to and rendezvous with a near-Earth asteroid, and investigate the object to determine its value as a source of space resources.”²⁶ News outlets report Prospector-X could be launched in early 2018 and Prospector-1 in 2019 or 2020.²⁷ At the time of this writing no launch has occurred. In order to attract investors to continue to fund these next steps, the industry needs legal certainty for its investors.

In addition to these private companies, the National Aeronautics and Space Administration (“NASA”) and other governmental space agencies have themselves recognized the potential rewards of asteroid mining. In 2000, long before Planetary Resource’s probe launch, NASA moved a probe into a near-Earth asteroid’s orbit.²⁸ A year later, the NEAR Shoemaker probe made touchdown on the surface of Eros, an S-class asteroid located approximately 355 million kilometers from Earth, and

²² Deep Space Industries, *The Business: Who We Are*, <https://deepspaceindustries.com/business/> [https://perma.cc/UFL4-ENSG] (last visited Jan. 17, 2018).

²³ *Id.* (emphasis omitted).

²⁴ Press Release, Deep Space Industries, *Prospector-X: An International Mission to Test Technologies for Asteroid Mining*, <https://deepspaceindustries.com/prospector-x-an-international-mission-to-test-technologies-for-asteroid-mining/> [https://perma.cc/5QZX-HN52] (last visited Jan. 16, 2018).

²⁵ Press Release, Deep Space Industries, *Prospector-1: First Commercial Interplanetary Mining Mission*, <http://deepspaceindustries.com/first-commercial-interplanetary-mission/>, [https://perma.cc/6J4J-4HLX] (last visited Jan. 16, 2018).

²⁶ *Id.*

²⁷ See, e.g., Rebecca Campbell, *Space Mining is Getting Close to Reality*, *Mining Weekly* (Dec. 15, 2017), <http://www.miningweekly.com/article/space-mining-is-getting-close-to-reality-2017-12-15-1> [https://perma.cc/LKE3-8DXX]; Bruce Dorminey, *Deep Space Industries to Probe Near-Earth Asteroid*, *Forbes* (Nov. 18, 2016, 5:29 AM), <https://www.forbes.com/sites/brucedorminey/2016/11/18/deep-space-industries-to-probe-near-earth-asteroid/#1c1cdf355e3b> [https://perma.cc/DC43-KGWS].

²⁸ See Shaer, *supra* note 5.

retrieved ten times more data than originally planned.²⁹ Furthermore, NASA's current Asteroid Redirect Mission ("ARM") plans to collect a multi-ton boulder from the surface of a large near-Earth asteroid and place it into orbit around the Moon.³⁰ Once in stable orbit, NASA astronauts will explore and return with samples from the boulder. NASA hopes to achieve its mission in the 2020s and is currently cataloguing near-Earth asteroids to find candidates for its mission.³¹ In September 2016, NASA set this mission into action when it successfully launched the OSIRIS-REx space probe, which will spend the next two years travelling to the asteroid Bennu.³² After months of observation, the probe will attempt to secure a sample of rocks and dust kicked up using a robotic arm.³³ This asteroid sample collection would be a first for the United States, though Japan successfully collected a small sample in 2010 during its Hayabusa mission.³⁴

These missions illustrate interest in asteroids, but the question remains: why asteroids and what do they even have to offer? In an age of resource scarcity, asteroids actually offer something crucial: a potential supplement, or even alternative, to the scarce resource pool here on Earth.³⁵ One NASA study found that "an industry could develop to send refined materials, rare metals and even free, clean energy to

²⁹ NASA., Missions: NEAR Shoemaker: In Depth, <https://solarsystem.nasa.gov/missions/near-shoemaker/in-depth/> (last visited Nov. 14, 2017) (adapted from Asif A. Siddiqi, *Deep Space Chronicle: A Chronology of Deep Space and Planetary Probes 1958–2000*, NASA Monographs in Aerospace History No. 24, at 162–63 (2002)); see also Shaer, *supra* note 5 (discussing the European Space Agency's successful passing of an asteroid 280 million miles from Earth).

³⁰ NASA., Asteroid Redirect Mission: Overview, <https://www.nasa.gov/content/what-is-nasa-s-asteroid-redirect-mission> [<https://perma.cc/2YW7-2GBV>], (last visited Nov. 14, 2017).

³¹ *Id.*

³² Amanda Barnett, *NASA Launches Spacecraft to Intercept Asteroid*, CNN (Sept. 8, 2016, 10:42 PM), <http://www.cnn.com/2016/09/08/us/osiris-rex-nasa-asteroid-mission/> [<https://perma.cc/7P4T-RBN4>].

³³ *Id.*

³⁴ NASA, *Curation: Hayabusa Sample Collection*, <https://curator.jsc.nasa.gov/hayabusa/> [<https://perma.cc/4SMY-ZFQK>] (last visited Nov. 18, 2017).

³⁵ See, e.g., Philip T. Metzger et al., *Affordable, Rapid Bootstrapping of the Space Industry and Solar System Civilization*, 26 *J. Aerospace Eng'g* 18, 18 (2013) ("There is mounting evidence that these limits are beginning to be felt in some of the nonrenewable energy and mineral resources and that they cannot support current rates of population growth with industrialization for another century." (citations omitted)); Ian Hedges, *Note, How the Rest Was Won: Creating a Universally Beneficial Legal Regime for Space-Based Natural Resource Utilization*, 40 *Vt. L. Rev.* 365, 367–76 (2015).

Earth from asteroids and other bodies.”³⁶ Resources of the asteroid belt include ferrous metals, cement, phosphates, nitrogen, sulfur, and sulfides.³⁷ Industry experts claim the resources found in one asteroid could be worth trillions of dollars.³⁸

Some critics assert that the so-called need for an extraterrestrial source of minerals is overestimated and overlooks untapped potential on Earth.³⁹ These critics must be taken with a grain of salt, as many of them are stakeholders in the traditional earth-mining industry and therefore self-interested.⁴⁰ However, even granting these critiques as irrefutable for argument’s sake, they still fail to diminish the case for asteroid-mining ventures. In fact, the greatest benefit such ventures offer is not necessarily a new and vast resource pool for needs on Earth, but rather an extraterrestrial resource pool to fuel further exploration in space. By utilizing fuel sources and resources already located in space, rather than carrying them from Earth, exploration missions would require exponentially less fuel and would be able to travel farther into deep space and conduct more in-depth studies while there.

³⁶ Steven Sicheloff, Study: Asteroids Provide Sustainable Resource, NASA (June 13, 2013), https://www.nasa.gov/mission_pages/asteroids/news/asteroidmining.html [<https://perma.cc/L5SL-9CLZ>]. This article discusses the implications of Metzger et al., *supra* note 35, a study completed by a team of researchers led by a physicist at NASA’s Kennedy Space Center.

³⁷ Lewis, *supra* note 1, at 98–103.

³⁸ See James Rathz, Law Provides New Regulatory Framework for Space Commerce, Reg. Rev. (Dec. 31, 2015), <https://www.theregreview.org/2015/12/31/rathz-space-commerce-regulation/> [<https://perma.cc/7FB6-WTY5>] (“The minerals in one asteroid in our solar system may be worth about \$95 trillion, greater than the entire world’s gross domestic product last year.”). Shaer, *supra* note 5; Asterank, Home, <http://www.asterank.com/> [<https://perma.cc/3DNT-9VUV>] (last visited Nov. 14, 2017) (website created and maintained by engineer Ian Webster and acquired by Planetary Resources in 2013) (estimating values of asteroids based on mass and spectral type using data from NASA’s Jet Propulsion Laboratory Small-Body Database and the International Astronomical Union Minor Planet Center).

³⁹ John W. Miller, Exhausting the Earth’s Resources? Not so Fast, Wall St. J. (June 4, 2012, 5:30 PM), <http://www.wsj.com/articles/SB10001424052702303630404577392104017737774>.

⁴⁰ *Id.* (“But firms that make their money mining this planet say the Earth is one big, practically inexhaustible mine, with just as many unexplored corners as outer space.” (emphasis added)). Admittedly, however, many of those touting the immense value of space resources are the space-mining companies themselves. NASA’s work with asteroids does provide the organization with some credibility though. See discussion and accompanying notes, *infra* Part II.A.

In fact, NASA views its ARM program as a necessary step toward a human mission to Mars.⁴¹ Because “[a] human mission to and from the Mars system could last 500 days or longer, including six to nine months of transit each way[,] [m]issions to Mars will need to be ‘Earth Independent.’”⁴² Planetary Resources explains the exponential benefits of achieving Earth Independence by analogizing current space travel to what a cross-country road trip would look like if it had to be conducted with restraints similar to those facing space exploration missions.⁴³ There would be no stopping at gas stations, and thus, any fuel required to make the cross-country journey would have to be carried by the car. In addition to decreasing fuel efficiency, this restraint would also likely prevent the car from even making it across the country. Space missions actually face this restraint from the need to carry fuel, making deep-space exploration difficult, if not impossible, today. Furthermore, the problem is exacerbated because escaping the first 300 kilometers of Earth’s gravity well takes more energy and propellant than the next 300 million kilometers of travel.⁴⁴ Because travel beyond Earth’s gravity well is virtually effortless, the ability to refuel in space, rather than by bringing resources from Earth into space, could open the door to limitless exploration. The prospect of such far-reaching returns is too great to ignore any longer.⁴⁵

By providing refueling stations and mineral resources in space, asteroid mining would also advance other private space ventures. Some of these other ventures are quite revolutionary. For example, SpaceX, a private company that “designs, manufactures and launches advanced

⁴¹ NASA, How Will NASA’s Asteroid Redirect Mission Help Humans Reach Mars? (June 27, 2014), <https://www.nasa.gov/content/how-will-nasas-asteroid-redirect-mission-help-humans-reach-mars> [<https://perma.cc/PJW7-B4SC>].

⁴² *Id.* NASA’s Mars Space Pioneering Challenge in 2015 further illustrates the importance it places on achieving Earth Independence. See NASA, Space Pioneering – Achieving Earth Independence (May 5, 2015), <https://www.nasa.gov/feature/space-pioneering-achieving-earth-independence> [<https://perma.cc/X7DW-585C>].

⁴³ Planetary Resources, Planetary Resources - The Market Problem and Radical Solution, YouTube (Nov. 21, 2013), <https://www.youtube.com/watch?v=VLouRKHknOU> [<https://perma.cc/YK3M-6C9H>].

⁴⁴ *Id.* at 0:30.

⁴⁵ *Id.* at 1:28, 1:56 (asserting that electrolyzed water exists in near infinite quantities on asteroids and could provide a fuel source “one thousand times more efficient than the brute force, bring-everything-with-you approach used by the Apollo moon program”); *id.* at 1:39 (claiming asteroids can serve as both the “future oil fields of space” and “high-grade precious-metal mines”).

rockets and spacecraft,”⁴⁶ first launched its own rocket in 2010 and now regularly runs deliveries to the International Space Station.⁴⁷ Elon Musk, founder and CEO of the company, also once announced a desire to terraform the Martian atmosphere by detonating thermonuclear devices over the poles of Mars in the hopes of future colonization.⁴⁸ Blue Origin, a private spaceflight company started by Amazon.com founder Jeff Bezos, is developing reusable spaceflight technology.⁴⁹ Moon Express, a lunar mining company, just received a favorable ruling from the United States government that grants the company permission to travel beyond Earth’s orbit and land on the Moon.⁵⁰ The mission was planned for 2017, but has been pushed to 2018 due to rocket issues.⁵¹ The viability and sustainability of such revolutionary projects would be greatly enhanced by the possibility of Earth Independence promised by mining asteroids.

Although much work remains in developing the technology, immense progress has been made over the past two decades and the technological groundwork has been laid.⁵² However, the legal groundwork up to this point—including the SREU Act—leaves much to be desired and much continued uncertainty for investors.

⁴⁶ SpaceX, Company, <http://www.spacex.com/about> [https://perma.cc/GCK5-XWDC] (last visited Jan. 17, 2018).

⁴⁷ Shaer, *supra* note 5.

⁴⁸ Thomas J. Herron, Note, Deep Space Thinking: What Elon Musk’s Idea to Nuke Mars Teaches Us About Regulating the “Visionaries and Daredevils” of Outer Space, 41 Colum. J. Envtl. L. 553, 554–55 (2016) (describing Musk’s plan and its legality).

⁴⁹ Blue Origin LLC, Technology, <https://www.blueorigin.com/technology> [https://perma.cc/SA5F-2N9N] (last visited Jan. 16, 2018); Elizabeth Howell, Jeff Bezos: Biography of Blue Origin, Amazon Founder, Space.com (Jan. 18, 2013, 5:44 PM), <https://www.space.com/g00/19341-jeff-bezos.html?i10c.encReferrer=aHR0cHM6Ly9wZXJtYS5jYy9VWDNKLVAzS1E%3D&i10c.ua=1> [https://perma.cc/B7KJ-LCL4].

⁵⁰ Press Release, Federal Aviation Administration, Fact Sheet – Moon Express Payload Review Determination (Aug. 3, 2016), https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=20595 [https://perma.cc/H74A-QT65]; Press Release, Moon Express, U.S. Government Approves Plan for Moon Express to Become First Private Company to Venture Beyond Earth’s Orbit (Aug. 3, 2016), <http://www.moonexpress.com/news/us-government-approves-plan-moon-express-become-first-private-company-venture-beyond-earths-orbit/> [https://perma.cc/DJR4-MGB5].

⁵¹ Michael Roston, Rocket Launches and Trips to the Moon We’re Looking Forward to in 2018, N.Y. Times (Jan. 1, 2018), <https://www.nytimes.com/2018/01/01/science/2018-spacex-moon.html>; Moon Express, *supra* note 50.

⁵² See generally Shaer, *supra* note 5 (providing an in-depth overview of Deep Space Industries’ and Planetary Resources’ progress).

B. The Scholarship

Although the SREU Act brings attention to the question of whether the current state of international law allows for property rights in space resources extracted for commercial purposes, the debate has long been underway.⁵³ This debate, however, has always been hypothetical. Never before has domestic legislation sought to impart a bundle of property rights to its citizens in any space resources retrieved for commercial purposes. Never before has there been substantive law to test the property rights prohibited or envisioned by the OST. Previous hypothetical analyses of property rights in space provide a useful starting point for considering the compatibility between the SREU Act and the United States' international obligations and are oft-cited throughout this Note. Those analyses were unable, however, to take into account the most current legal and scientific information discussed in the congressional hearings related to the SREU Act, not to mention the actual language of the SREU Act and the rights it creates.

Over the course of the writing and publication of this Note, the number of secondary sources discussing the SREU Act has increased steadily—some simply cite to the Act, some provide a high-level overview of the terms of the Act, and some attempt to answer the specific question at hand.⁵⁴ Nevertheless, of the sources found, only three engage in a thorough textual analysis and interpretation of the Treaty.⁵⁵ This Note offers a unique contribution to current scholarship as it has access to the most current, relevant information available and takes the time to walk through the steps of treaty interpretation required to properly understand the international obligations of the United States.

⁵³ See *infra* note 111.

⁵⁴ A “Citing References” search of 51 U.S.C. §§ 51301–51303 and a term search of “Space Resource Exploration and Utilization” in Westlaw illustrates the growth in writing about this subject over time since the bill’s passage, particularly in the last year. See, e.g., *infra* notes 58–84.

⁵⁵ See P.J. Blount & Christian J. Robison, *One Small Step: The Impact of the U.S. Commercial Space Launch Competitiveness Act of 2015 on the Exploitation of Resources in Outer Space*, 18 N.C. J.L. & Tech. 160, 168 (2016); Andrew Lintner, *Note, Extraterrestrial Extraction: The International Implications of the Space Resource Exploration and Utilization Act of 2015*, 40 Fletcher F. Foreign Aff. 139, 139 (2016); John Myers, *Note, Extraterrestrial Property Rights: Utilizing the Resources of the Final Frontier*, 18 San Diego Int’l L.J. 77, 123–27 (2016); see also *infra* notes 65–84 and accompanying text (discussing the textual analyses in these three sources).

The other sources still provide important contributions and illuminating insight.⁵⁶ For example, Professor Michael Dodge provides an articulate, high-level overview of the entire U.S. Commercial Space Launch Competitiveness Act of 2015 and briefly identifies potential issues and gaps of the SREU Act.⁵⁷ Additionally, Major Susan J. Trepczynski, Chief of the U.S. Air Force Air and Space Law Division, highlights the value to be found in the United States' attempts to start filling the vast voids of space law with a domestic legal regime.⁵⁸ Student authors Kevin MacWhorter and Samuel Roth provide hope for the future by exploring innovative proposals for a legal regime to govern property rights in space. MacWhorter identifies the unknown characteristics of asteroids that still need to be understood to achieve a proper solution,⁵⁹ while Roth identifies the empirical, scientific questions that still need answers.⁶⁰ Student author Alison Morris sets

⁵⁶ For some particularly well-written and insightful commentary, see, for example, Virginie Blanchette-Séguin, Commentary, Reaching for the Moon: Mining in Outer Space, 49 N.Y.U. J. Int'l L. & Pol. 959, 960 (2017) (providing an enlightening discussion of the property rights over space resources questions, but without conducting a treaty analysis applying the rules of the Vienna Convention); Juan Davalos, Comment, International Standards in Regulating Space Travel: Clarifying Ambiguities in the Commercial Era of Outer Space, 30 Emory Int'l L. Rev. 597, 599 (2016) (discussing a variety of ambiguities in the commercial era of outer space).

⁵⁷ Michael Dodge, The U.S. Commercial Space Launch Competitiveness Act of 2015: Moving U.S. Space Activities Forward, 29 Air & Space Law., no. 3, at 4 (2016) (conducting no textual analysis and reserving in-depth analysis for future consideration); see also Craig Foster, Note, Excuse Me, You're Mining My Asteroid: Space Property Rights and the U.S. Space Resource Exploration and Utilization Act of 2015, 2016 U. Ill. J.L. Tech. & Pol'y 407 (recognizing the ongoing debate over the compatibility of the SREU Act with the OST as a potential drawback of the law without answering the open question, instead providing an expansive overview of the asteroid-mining industry, the current legal framework, an observant comparison of asteroid mining to deep-sea mining, and suggestions for the future).

⁵⁸ Major Susan J. Trepczynski, New Space Activities Expose a Potential Regulatory Vacuum, 43 Reporter, no. 3, 2016, at 12, 19–20. (recognizing the gap-filling benefits of the new law, but remaining silent with respect to any international conflict).

⁵⁹ Kevin MacWhorter, Note, Sustainable Mining: Incentivizing Asteroid Mining in the Name of Environmentalism, 40 Wm. & Mary Envtl. L. & Pol'y Rev. 645, 646 (2016) (focusing on proposals rather than examining the technical compliance with the OST, though recommending an amendment to clarify the property rights ambiguity of the Treaty).

⁶⁰ Samuel Roth, Note, Developing a Law of Asteroids: Constants, Variables, and Alternatives, 54 Colum. J. Transnat'l L. 827, 840–57 (2016) (discussing the shortcomings of the current international and domestic legal framework and insightfully offering four plausible explanations for the ambiguities left by Title IV of the SREU Act's grant of property rights in space resources, focusing on policy rather than conducting a legal, textual treaty interpretation analysis).

forth three additional “futures” of international regulation of space property⁶¹ and economics professor Alexander Salter proposes a “purely private legal system for space commerce as an alternative to government-defined and enforced property rights.”⁶² Another student author, Stephen DiMaria, contributes to the discussion with an analysis and reconciliation of the short- and long-term benefits and viability of the SREU Act.⁶³ On the other hand, these pieces simply do not—and were not intended to—address the question this Note seeks to answer: whether or not the United States abrogated its international obligations by passing the SREU Act. Rather than simply identify or swiftly dismiss the tension with Article II of the OST, this Note seeks to contribute to the literature by taking on this once hypothetical, but now live, question.

In order to make this meaningful contribution, this Note must conduct a thorough interpretation of the relevant terms of the OST, just as a court would.⁶⁴ As discussed in Part III.B, a proper interpretation of the terms of the OST is crucial because the terms establish the obligations of the United States with respect to space. Only after these obligations are accurately identified can it be determined whether the SREU Act breaches them. As mentioned, three other articles have already conducted analyses more in line with this interpretative focus since the

⁶¹ Alison Morris, Note, Intergalactic Property Law: A New Regime for a New Age, 19 Vand. J. Ent. & Tech. L. 1085, 1102–14 (2017).

⁶² Alexander William Salter, Ordering the Cosmos: Private Law and Celestial Property Rights, 82 J. Air L. & Com. 311, 311, 316–30 (2017).

⁶³ See generally Stephen DiMaria, Note, Starships and Enterprise: Private Spaceflight Companies’ Property Rights and the U.S. Commercial Space Launch Competitiveness Act, 90 St. John’s L. Rev. 415, 438–40 (2016) (finding the SREU Act to be a viable short-term solution to the problem facing private space-mining ventures and concluding that the Act does not conflict with OST Art. II (non-appropriation principle) without conducting a textual analysis of the OST).

⁶⁴ Many authors thoughtfully and logically consider whether the SREU Act is compatible with the international treaty obligations of the United States. Nevertheless, they often fail to conduct a textual analysis of the OST to determine the baseline of U.S. international obligations in space, a necessary first step in the analysis. See, e.g., Eng Teong See, Commercialization of Space Activities—The Laws and Implications, 82 J. Air L. & Com. 145, 157–63 (2017) (insightfully discussing possible arguments for and against the compatibility of the SREU Act, including possible interpretations of the Treaty and a discussion of its *travaux préparatoires*); Elliot Reaven, Note, The United States Commercial Space Launch Competitiveness Act: The Creation of Private Space Property Rights and the Omission of the Right to Freedom from Harmful Interference, 94 Wash. U. L. Rev. 233, 236–41 (2016).

passage of the SREU Act.⁶⁵ Similar to the analysis that follows, these three pieces recognized the terms of the OST to be quite ambiguous with respect to property rights.⁶⁶ The previous authors, however, interpret this ambiguity in favor of compatibility,⁶⁷ while this Note concludes the SREU Act to be incompatible with the OST.

In order to come to his conclusion of compatibility between the SREU Act and the OST, student author Andrew Lintner relies on a parsing of the difference between space resources and space resources removed, concluding that the OST's prohibition against national appropriation applies to the former, but not the latter.⁶⁸ This interpretation relies on the assumption that national appropriation occurs when a state approves an individual actor's claims over real property (which Lintner reads to include resources still in situ), but not when a state approves an individual actor's removal of resources from the land. As will be shown, this semantic parsing fails to take into account that: (1) the ordinary meaning of "appropriation" envisions taking of resources, not just real property,⁶⁹ and (2) traditional international property law requires a nation to have title to resources before it may bestow rights in those resources upon its citizens.⁷⁰ Thus, the conclusion that in situ resources are off limits, while extracted resources are not, fails a test of logical consistency and overlooks nuances of the Treaty terms.

Similarly, student author John Myers concludes that the SREU Act does not constitute a breach of international obligations, but for a slightly different reason: Treaty partners did not intend for the OST to govern property rights and, instead, anticipated a future agreement to control.⁷¹ In coming to this conclusion, Myers relies heavily on the purpose of the Treaty as an antimilitarization instrument of the Cold War and committee discussions during negotiations.⁷² Myers utilizes these "*travaux préparatoires*" in attempts to resolve the ambiguity of the ordinary meaning of the Treaty terms.⁷³ However, the analysis fails to

⁶⁵ Lintner, *supra* note 55, at 139; Myers, *supra* note 55, at 90–107.

⁶⁶ Lintner, *supra* note 55, at 140; Myers, *supra* note 55, at 100, 102.

⁶⁷ Lintner, *supra* note 55, at 153; Myers, *supra* note 55, at 123–24.

⁶⁸ Lintner, *supra* note 55, at 147.

⁶⁹ See *infra* Subsection IV.A.1.

⁷⁰ See *infra* Subsection IV.A.1.

⁷¹ Myers, *supra* note 55, at 100.

⁷² *Id.* at 94–100.

⁷³ *Id.* at 100.

recognize and resolve the ambiguities also surrounding the *travaux préparatoires* materials, such as the purpose of the Treaty and committee discussions of the resources question. For example, the Cold War mentality and peaceful purpose arguments also encompass the prevention of disputes over natural resources, which were historically some of the bloodiest, in addition to preventing nuclear warfare.⁷⁴ Furthermore, the cited committee discussions also contain passages suggesting that Article II and its prohibition against appropriation resolve the property rights dispute in the interim, though a future agreement might arise.⁷⁵ Finally, it does not necessarily follow from the conclusion that the Treaty parties anticipated a future agreement regarding property rights that the OST would permit property rights in space resources in the interim, as an analogy to the Antarctic experience will show.⁷⁶

Lastly, Professor P.J. Blount and Christian J. Robison urge that critics viewing the SREU Act as incompatible with the OST have misinterpreted the ambiguities of Article II.⁷⁷ According to Blount and Robison, the ambiguities of Article II signal that the drafters of the OST intentionally left a gap between the right to “use” space and the prohibition against “appropriating” space⁷⁸ “so that the law could adapt as the technology emerged.”⁷⁹ As a result, states are free to fill this gap, and the SREU Act is best read as an exercise of such gap-filling ability and as a state interpretation of the content of Article II.⁸⁰ At first blush these arguments are attractive. One would be hard-pressed to disagree that Article II and the OST as a whole are abundantly full of ambiguities or that the technological landscape has vastly changed in the last forty to fifty years. Nevertheless, while Blount and Robison point out areas of ambiguity, a more systematic analysis of the Treaty language pursuant to the Vienna Convention and other international standards of treaty interpretation might help resolve some of these ambiguities. Further, while the SREU Act’s requirement that resources be “obtained in accordance with applicable law, including the international obligations

⁷⁴ See *infra* Subsection IV.A.3.

⁷⁵ See *infra* Subsection IV.A.2.

⁷⁶ See *infra* Subsection IV.A.3.

⁷⁷ Blount & Robison, *supra* note 55, at 161–63, 168, 177.

⁷⁸ *Id.* at 168.

⁷⁹ *Id.* at 162.

⁸⁰ *Id.* at 177.

of the United States”⁸¹ may admittedly indicate its intent to comply with international law and fill gaps in the law, the presence of this “careful language”—as Blount and Robison call it⁸²—in the statute does not ultimately resolve whether the bundle of property rights is compatible with the OST. Rather, the careful language only seems to indicate that the lawmakers believed the law was compatible. In response, this Note continues to grapple with the ambiguities of the OST by conducting an interpretation of the Treaty and its obligations as a court would. While international treaties are admittedly filled with ambiguity, oftentimes simply because of language differences at the negotiating and drafting table, it does not follow that each ambiguity calls for gap-filling legislation at the individual state level.⁸³ If the rule of international law is to mean anything, efforts must be made to parse these difficult ambiguities in depth before waiving the white flag. Furthermore, this Note refuses to accept the “careful language” of the SREU Act as reassurance that the United States has not abrogated its Treaty obligations.⁸⁴

As these three articles illustrate, the ambiguity of the Treaty terms runs deep. In order to discern the accurate meaning of the Treaty, a more thorough treaty interpretation analysis must be conducted. This Note offers such an analysis by utilizing, as a court would, the treaty interpretation rules discussed in Part III.B and providing an updated, and much-needed, comprehensive analysis of this once hypothetical, now pressing, issue.⁸⁵

⁸¹Pub. L. 114-90, § 402, 129 Stat. 704, 720–21 (to be codified at 51 U.S.C. § 51303).

⁸²Blount & Robison, *supra* note 55, at 180.

⁸³Cf. *id.* at 179–80 (discussing the role domestic gap-filling plays).

⁸⁴See *infra* Section IV.B.

⁸⁵Recent hearings of the U.S. Senate Subcommittee on Space, Science, and Competitiveness and the introduction of a House bill entitled “American Space Commerce Free Enterprise Act of 2017” highlight the pressing nature of the need for a thorough review and interpretation of the OST, or at the very least a framework for interpretation. See *Reopening the American Frontier: Exploring How the Outer Space Treaty Will Impact American Commerce and Settlement in Space: Before the S. Comm. on Com., Sci., & Transp.*, 115th Cong. (2017), <https://www.commerce.senate.gov/public/index.cfm/2017/5/reopening-the-american-frontier-exploring-how-the-outer-space-treaty-will-impact-american-commerce-and-settlement-in-space> [<https://perma.cc/ZUW8-QYBZ>] (discussing how U.S. law should respond to the OST but not focusing on the SREU Act or space mining specifically); H.R. 2809, 115th Cong. (2017) (introduced June 7, 2017) (including strong language that it is the nation’s policy that “United States citizens and entities are free to

III. LEGAL FRAMEWORK

Although the SREU Act intends to resolve the stifling uncertainty as to the status of property rights over space resources extracted by American companies like Planetary Resources and Deep Space Industries, the question still remains as to whether or not such a grant of rights violates the United States' international treaty obligations. In order to aid the examination of this issue in Part IV, this Part provides a necessary overview of the current legal framework of space law and treaty interpretation.

A. Space Law

This Section provides an overview of current space law relevant to the question at hand. Additionally, several analogous treaties are considered, as their history and provisions may provide insight regarding the status and interpretation of the OST, the legal authority relevant to the question at hand.

1. The Outer Space Treaty

Commonly known as the Magna Carta of Space,⁸⁶ the OST sets out to contribute to “broad international co-operation in the scientific as well as legal aspects of the exploration and use of outer space for peaceful purposes.”⁸⁷ In 1967, the Treaty officially became law in the United States after overwhelming Senate approval⁸⁸ and ratification by President Lyndon B. Johnson.⁸⁹ As of the latest U.N. report, 105 states have fully ratified the Treaty and 25 additional states have signed.⁹⁰

explore and use space, including the utilization of outer space and resources contained therein, without conditions or limitations”).

⁸⁶ Francis Lyall & Paul B. Larsen, *Space Law: A Treatise* 53–54 (2009).

⁸⁷ Outer Space Treaty, *supra* note 14, at pmbl., 18 U.S.T. at 2411, 610 U.N.T.S. at 207.

⁸⁸ 113 Cong. Rec. 10677, 10687 (daily ed. April 25, 1967).

⁸⁹ U.S. Dept. of State, *Current Treaties and Agreements: Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, <http://www.state.gov/t/isn/5181.htm#signatory> [<https://perma.cc/PQ8U-KBRC>] (last visited Nov. 11, 2017).

⁹⁰ Comm. on the Peaceful Uses of Outer Space, *Status of International Agreements Relating to Activities in Outer Space as at 1 January 2017*, U.N. Doc. A/AC.105/C.2/2017/CRP.7, at 12 (March 23, 2017) [hereinafter *Status of International Agreements*], http://www.unoosa.org/documents/pdf/spacelaw/treatystatus/AC105_C2_2017_CRP07E.pdf [<https://perma.cc/KT4N-G2RU>].

Several provisions of the Treaty are considered relevant to the question of property rights in extracted resources. Because the exact language will be crucial for purposes of interpreting the meaning of the Treaty and in turn the United States' obligations' arising from the Treaty, the relevant portions are reproduced below verbatim:

Article I

The exploration and use of outer space, including the moon and other celestial bodies, *shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.*

Outer space, including the moon and other celestial bodies, shall be *free for exploration and use by all States* without discrimination of any kind, on a basis of equality and in accordance with international law, and there *shall be free access* to all areas of celestial bodies.

There shall be *freedom of scientific investigation* in outer space, including the moon and other celestial bodies, and *States shall facilitate and encourage international co-operation in such investigation.*

Article II

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.*

Article III

States Parties to the Treaty shall carry on activities . . . *in the interest of maintaining international peace and security and promoting international co-operation and understanding.*

. . .

Article VI

States . . . 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. The activities of non-governmental entities in outer

space . . . shall require authorization and continuing supervision by the appropriate State .⁹¹

The OST does not directly confront individual property rights in space.⁹² Nevertheless, there remains traction to the argument that property rights are prohibited by the Treaty, given Article I's provision that the exploration and use of space shall be "for the benefit and in the interest of all"⁹³ and Article II's prohibition against appropriation, as will be discussed in further in Part IV.

2. The Moon Agreement

Almost two decades after enacting the OST, following momentous space events such as the first man on the Moon, the United Nations and its members attempted to resolve the question of property rights once and for all. The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies,⁹⁴ better known as the Moon Agreement, entered into force on July 11, 1984.⁹⁵ Unlike its successful predecessor, the Moon Agreement has only been ratified by eighteen nations and signed by an additional four as of January 1, 2017.⁹⁶ Despite participating actively in negotiations, both of the stars of the Space Race, the United States and the Union of Soviet Socialist Republics, failed to even sign the Agreement, let alone ratify it.⁹⁷ The Agreement hoped to continue to keep the Moon and outer space free from conflict

⁹¹ Outer Space Treaty, *supra* note 14, arts. I–III, VI, 18 U.S.T. at 2412–15, 610 U.N.T.S. at 207–09 (emphasis added to illustrate points of contention to be discussed in Part IV.A).

⁹² See Tronchetti, *supra* note 15, at 7 ("International space law clearly defines the status of celestial bodies while it leaves that of their resources rather uncertain. Celestial bodies are not subject to appropriation; pursuant to Article II of the 1967 Outer Space Treaty States are forbidden from extending their territorial sovereignty over outer space or any parts of it." (citations omitted)) (citing to the OST and highlighting its lack of reference to resources of celestial bodies).

⁹³ *Id.*, art. I, 18 U.S.T. at 2412–13, 610 U.N.T.S. at 207–08.

⁹⁴ Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 5, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement].

⁹⁵ Status of International Agreements, *supra* note 90, at 2.

⁹⁶ *Id.* at 12; United Nations, Depository Notification: Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Armenia – Accession, U.N. Doc. C.N.40.2018.TREATIES-XXIV.2 (Jan. 19, 2018), <https://treaties.un.org/doc/Publication/CN/2018/CN.40.2018-Eng.pdf>.

⁹⁷ Status of International Agreements, *supra* note 90, at 9, 11.

and update the law based on the progress in space exploration and science.⁹⁸

The Moon Agreement not only reaffirmed the OST's nonappropriation principle, but also attempted to explicitly address some of the questions regarding extraterrestrial property rights that still remain uncertain today.⁹⁹ The Moon Agreement specifically provides for the right to collect and remove samples of minerals and other substances from the Moon and other celestial bodies,¹⁰⁰ but only if the samples remain at the disposal of the state parties causing their collection and are used for *scientific* purposes.¹⁰¹ The Agreement does not provide a similar right for use of such resources for commercial activities. Instead, the Agreement provides: "Neither the surface nor the subsurface of the moon [or any celestial body], nor any part thereof or natural resources in place, shall become property of any State, international inter-governmental or non-governmental organization, national organization or non-governmental entity or of any natural person."¹⁰² The Agreement does leave the door open to property rights over natural resources in the future by putting the duty on parties to establish an international regime to govern the exploitation of natural resources in space should such practice become feasible.¹⁰³ The impact of this nonbinding instrument will be discussed more in Part IV.

3. U.S. Domestic Law

Prior to the passage of the SREU Act, U.S. domestic law regarding nongovernment activities in space did not address resource property rights. Instead, the laws focused mostly on establishing a procedure for the licensing and regulation of commercial space launches, as well as creating a liability and indemnification regime.¹⁰⁴ With its provision of

⁹⁸ Moon Agreement, *supra* note 94, at pmb., 1363 U.N.T.S. at 22.

⁹⁹ Moon Agreement, *supra* note 94, art. 11, 1363 U.N.T.S. at 25; Outer Space Treaty, *supra* note 14, art. II, 18 U.S.T. at 2413, 610 U.N.T.S. at 208.

¹⁰⁰ Article 1.1 of the Moon Agreement makes clear that all provisions of the Agreement relating to the Moon also apply to other celestial bodies. Moon Agreement, *supra* note 94, art. 1.1, 1363 U.N.T.S. at 22.

¹⁰¹ *Id.*, art. 6.2, 1363 U.N.T.S. at 24.

¹⁰² *Id.*, art. 11.3, 1363 U.N.T.S. at 25.

¹⁰³ *Id.*, art. 11.5, 1363 U.N.T.S. at 25.

¹⁰⁴ See, e.g., Commercial Space Launch Amendments Act of 2004, Pub. L. No. 108-492, 118 Stat. 3974 (codified in various sections of Title 49 of the U.S. Code); Commercial Space Act of 1998, Pub. L. No. 105-303, 112 Stat. 2843 (prior to 2004 amendments); Commercial

property rights to U.S. citizens in resources extracted from asteroids and other spatial bodies, the SREU Act became the first national law authorizing property rights in space.¹⁰⁵

The SREU Act explicitly grants property rights to U.S. citizens in any asteroid or space resources recovered for commercial purposes.¹⁰⁶ The property rights include the right to “possess, own, transport, use, and sell” the resources so long as doing so accords with applicable law and international obligations of the United States.¹⁰⁷ The Act defines a space resource as “an abiotic resource in situ in outer space . . . includ[ing] water and minerals” and an asteroid resource as “a space resource found on or within a single asteroid.”¹⁰⁸ Furthermore, the law purports to require the President to “facilitate” commercial resource exploration and recovery, “discourage government barriers” to the development of an “economically viable” industry, and “promote” citizens’ rights to commercial exploration and recovery.¹⁰⁹ Finally, the Act contains an entire section serving as a “disclaimer of extraterritorial sovereignty,”

Space Launch Act Amendments of 1988, Pub. L. No. 100-657, 102 Stat. 3900 (prior to 1998 and 2004 amendments); Commercial Space Launch Act, Pub. L. No. 98-575, 98 Stat. 3055 (1984) (prior to various amendments in 1988, 1998, and 2004). For an insightful description and overview of the pre-2015 space law regime in the United States, see Herron, *supra* note 48, at 586–89.

¹⁰⁵ Several countries are hot on the heels of the United States. On November 11, 2016, just shy of the one-year anniversary of the SREU Act’s enactment, Luxembourg announced the government’s adoption of “a draft law ensuring that private operators working in space can be confident about their rights to the resources they extract in outer space.” Press Release, Ministry of the Econ. for the Gov’t of the Grand Duchy of Lux., Luxembourg’s New Space Law Guarantees Private Companies the Right to Resources Harvested in Outer Space in Accordance with International Law (Nov. 11, 2016), http://www.spaceresources.public.lu/content/dam/spaceresources/press-release/2016/2016_11_11_PressReleaseNewSpaceLaw.pdf [<https://perma.cc/43C4-LNXA>]; Jessica Orwig, A Tiny European Country Just Made an Unprecedented Move in the Space Mining Business, *Business Insider* (Feb. 5, 2016, 5:19 PM), <http://www.businessinsider.com/luxembourg-wants-to-cash-in-on-asteroid-mining-2016-2> [<https://perma.cc/2UDV-FUUU>] (“Luxembourg and the US are the only two countries in the world who have begun to take legal action toward securing property rights for commercial companies who could, one day, collect rare and precious resources from asteroids.”).

¹⁰⁶ U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, §§ 401–03, 129 Stat. 704, 720–22 (2015) (to be codified at 51 U.S.C. §§ 10101, 51301–03) (citation refers to Title IV of the Act, which has been given the short title of “The Space Resource Utilization Act of 2015”).

¹⁰⁷ *Id.* § 402, 129 Stat. at 721 (to be codified at 51 U.S.C. § 51303).

¹⁰⁸ *Id.* (to be codified at 51 U.S.C. § 51301).

¹⁰⁹ *Id.* (to be codified at 51 U.S.C. § 51302).

likely to avoid implicating the nonappropriation principle in Article II of the OST, as will be discussed in Part IV.¹¹⁰

4. Analogous Treaties

Although scholars have debated the viability of property rights under the OST hypothetically for decades,¹¹¹ the legality of such rights in space under the Treaty has never actually been put to the test. With little to no precedent, analogous legal regimes lend insight to both the interpretation of the OST and to the normative question of what should be done.¹¹² Despite their terrestrial location, both the sea and Antarctica bear striking similarities to outer space, as they are also international areas governed by treaty systems. Additionally, the deep sea, Antarctica, and outer space all offer bountiful deposits of natural resources, catching the attention of nations and private investors alike. Exploration of each of these regions and the recovery of resources therefrom face an array of similar variables, including inhospitable and difficult-to-travel geography and expensive and still-developing technology, not to mention countless unknown elements. For these reasons, treaties related to the governance of Antarctica and the high seas will be considered in order to aid in interpreting the OST in Part IV.

¹¹⁰ Id. at § 403, 129 Stat. at 722 (to be codified at 51 U.S.C. § 51302). Outer Space Treaty, supra note 14, art. II, 18 U.S.T. at 2413, 610 U.N.T.S. at 208.

¹¹¹ See, e.g., Lyall & Larsen, supra note 86, at 183–85, 190–92; Leslie I. Tennen, Towards a New Regime for Exploitation of Outer Space Mineral Resources, 88 Neb. L. Rev. 794, 797–98, 804–14 (2010); Sarah Coffey, Note, Establishing a Legal Framework for Property Rights to Natural Resources in Outer Space, 41 Case W. Res. J. Int'l L. 119, 120 (2009); Lynn M. Fountain, Comment, Creating Momentum in Space: Ending the Paralysis Produced by the “Common Heritage of Mankind” Doctrine, 35 Conn. L. Rev. 1753, 1755 (2003); David Johnson, Comment, Limits on the Giant Leap for Mankind: Legal Ambiguities of Extraterrestrial Resource Extraction, 26 Am. U. Int'l L. Rev. 1477, 1485–87 (2011); Scott J. Shackelford, The Tragedy of the Common Heritage of Mankind, 28 Stan. Envtl. L.J. 109, 110 (2009); Jeremy L. Zell, Note, Putting a Mine on the Moon: Creating an International Authority to Regulate Mining Rights in Outer Space, 15 Minn. J. Int'l L. 489, 491–92 (2006).

¹¹² See, e.g., Sarah Jane Fox, SPACE: The Race for Mineral Rights—‘The sky is no longer the limit’—Lessons from Earth!, 49 Resources Pol’y 165, 168–72 (2016) (discussing the lessons that can be learned from the sea and air legal regimes); Coffey, supra note 111, at 128–32 (briefly identifying analogous features of mining in outer space, oceans, and Antarctica); Johnson, supra note 111, at 1488 (arguing that treaties over the high seas and Antarctica could serve as useful models regarding property rights in space).

B. Treaty Interpretation Rules

Because the OST establishes a majority of international space law, questions of treaty interpretation loom particularly large in the issue at hand. The terms of the OST establish the obligations of the United States. Thus, in order to understand the United States' international obligations with respect to space and, in turn, whether the SREU Act abrogates these obligations, the terms of the Treaty and their meaning must be accurately interpreted. The following provides an overview of the applicable treaty interpretation rules that guide and control this interpretation. Both U.S. and international rules are considered because there are slight nuances between the two approaches that might impact the conclusion depending on whether domestic or international litigation is pursued.

For example, some academic interpretations of the OST simply apply the principles set forth in the Vienna Convention¹¹³ in order to determine the status of property rights under the Treaty.¹¹⁴ Nevertheless, because the United States has yet to ratify the Vienna Convention¹¹⁵ and disagreement over the customary international law status of all of the Convention's provisions persists,¹¹⁶ a more realistic interpretation must also consider U.S. domestic interpretation methods. Despite not ratifying the Vienna Convention, the United States still has deep regard for its tools and the Vienna Convention would play a focal role in the interpretation of the OST even in a U.S. court.¹¹⁷ This discussion serves as a reminder that U.S. federal courts and the executive apply similar, but slightly different rules of interpretation that should not be ignored.¹¹⁸

¹¹³ Vienna Convention on the Law of Treaties arts. 27, 31–32, May 23, 1969, 1155 U.N.T.S. 331, 339–40 [hereinafter Vienna Convention].

¹¹⁴ See, e.g., Johnson, *supra* note 111, at 1493–94 (focusing exclusively on the Vienna Convention treaty-interpretation rules, though recognizing that customary international law may give rise to legal obligations above and beyond the text of the treaty).

¹¹⁵ See Cong. Research Serv., *Treaties and Other International Agreements: The Role of the United States Senate*, S. Prt. 106-71, 106th Cong. 2d Sess., at 20 (Comm. Print. 2001) (prepared for committee by the Congressional Research Service, discussing the inability of the Department of State and the Senate Foreign Relations Committee to agree on acceptable conditions despite the committee's recommendation to advise and consent to ratification with conditions) [hereinafter CRS Treaty Report].

¹¹⁶ *Id.* at 21.

¹¹⁷ *Id.* at 44–45 (discussing the position of the Department of State regarding the status of the Vienna Convention and providing statements of previous Secretary of State William P. Rogers and President Nixon regarding the Convention).

¹¹⁸ *Id.* at 163–64.

This domestic interpretation policy could nevertheless be problematic and ultimately risks being disregarded by an international interpretative body, but at least illuminates the discussion and persisting disagreement.

1. The Vienna Convention

Articles 31 and 32 of the Vienna Convention provide rules of interpretation for international treaties.¹¹⁹ In general, “[a] treaty shall be interpreted in good faith in accordance with the *ordinary meaning* to be given to the terms of the treaty in their *context* and in the light of its *object and purpose*.”¹²⁰ Article 31 goes on to discuss what constitutes “context” for purposes of the general rule.¹²¹ Interestingly, context has a more limited scope than the United States’ traditional notion of legislative history.¹²² Rather, context focuses on the treaty document itself, including the text of the preamble and annexes.¹²³ Subsequent agreements and practice relating to the interpretation and application of the Treaty and any relevant rules of international law that may apply with respect to the relations between the Treaty partners may be considered.¹²⁴

According to the Convention, other supplementary means of interpretation—i.e., means more analogous to U.S. legislative history such as preparatory work and circumstances surrounding the Treaty’s conclusion—may only be used in limited situations. The supplementary means may only be used (1) to confirm the meaning resulting from the application of the aforementioned general interpretation rules or (2) when the general rules lead to an “ambiguous or obscure” meaning or a result which is “manifestly absurd or unreasonable.”¹²⁵ The hierarchy set forth by Articles 31 and 32 emphasizes the “dominant position of the text itself in the interpretative process.”¹²⁶

¹¹⁹ Vienna Convention, *supra* note 113, arts. 31–32, 1155 U.N.T.S. at 340.

¹²⁰ *Id.*, art. 31, cl. 1, 1155 U.N.T.S. at 340 (emphasis added).

¹²¹ *Id.*, art. 31, cl. 2, 1155 U.N.T.S. at 340.

¹²² CRS Treaty Report, *supra* note 115, at 164.

¹²³ Vienna Convention, *supra* note 113, art. 31, cl. 2, 1155 U.N.T.S. at 340.

¹²⁴ *Id.*, art. 31, cl. 3, 1155 U.N.T.S. at 340.

¹²⁵ *Id.*, art. 32, 1155 U.N.T.S. at 340.

¹²⁶ CRS Treaty Report, *supra* note 115, at 163 (internal quotation marks omitted) (quoting Shabtai Rosenne, Interpretation of Treaties in the Restatement and the International Law Commission’s Draft Articles: A Comparison, 5 Colum. J. Transnat’l L. 205, 221 (1966)).

2. Domestic Interpretive Rules

As opposed to following the seemingly rigid hierarchy of the Vienna Convention, U.S. courts are generally more willing to look beyond the instrument to supplementary means in order to determine meaning.¹²⁷ In general, domestic interpretation of international treaties “aims at ascertaining the meaning intended by the parties in the light of all relevant factors.”¹²⁸ The Reporter Notes in the Restatement (Third) of Foreign Relations Laws implore that a United States court or agency *must* consider preparatory materials made by the United States that might not be considered by international interpretive bodies.¹²⁹ These materials may include: committee reports, legislative debates, negotiation documents and statements, unilateral statements of understanding, executive interpretations, and any other documents relating to the formation of an international agreement.¹³⁰ Additionally, courts appear to give notable deference to the meanings given to agreements by the executive branch and other governmental departments closely involved with the different stages of the agreements’ creation and enforcement.¹³¹

3. Further Treaty Interpretation Remarks

Disputes regarding the interpretation of a treaty are usually settled by consultation or negotiation, but if such means prove unsuccessful, parties may resort to more formal dispute settlement procedures.¹³² According to Article XIII of the OST, any questions regarding activities related to the exploration and use of outer space “shall be resolved by the States Parties to the Treaty either with the appropriate international organization or with one or more States members of that international

¹²⁷ Restatement (Third) of Foreign Relations Law of the United States § 325 cmt. g & rep. n.1 (Am. Law. Inst. 1986) [hereinafter Restatement (Third)].

¹²⁸ CRS Treaty Report, supra note 115, at 164.

¹²⁹ Restatement (Third), supra note 127, § 325 rep. n.5.

¹³⁰ *Id.*

¹³¹ See, e.g., *Kolovrat v. Oregon*, 366 U.S. 187, 194 (1961) (“While courts interpret treaties for themselves, the meaning given them by the departments of government particularly charged with their negotiation and enforcement is given great weight.”); CRS Treaty Report, supra note 115, at 163–66 discussing the weight of different administrative and congressional interpretations of treaties); Restatement (Third), supra note 127, § 325 rep. n.5(ii).

¹³² CRS Treaty Report, supra note 115, at 157.

organization, which are Parties to this Treaty.”¹³³ Though this provision leaves unclear exactly where a dispute between a domestic court’s interpretation of the Treaty and that of an international body might be resolved, the Vienna Convention suggests that if resolution does not occur within a year of dispute notification to the offending party, the dispute may be referred to the International Court of Justice (“ICJ”).¹³⁴ Despite the possibility of ultimate resolution by a body governed by the Vienna Convention like the ICJ, this Note still insists upon consideration of *travaux préparatoires* (preparatory work) for several reasons. Professor Richard Gardiner, who has done extensive work in the field of treaty interpretation, asserts that applications of the Vienna Convention’s rules, in practice, “reveal a quite loose structure for developing interpretations, rather than a straightjacket or formulaic set of requirements.”¹³⁵ Viewed in light of increased textualism in statutory interpretation by the U.S. courts,¹³⁶ there appears to be somewhat of a convergence of the two approaches,¹³⁷ and both should be given due consideration. Ultimately, perhaps this difficulty and debate in even determining how to interpret the OST simply goes to show that the real legal debate regarding property rights in space resources will not be resolved within the framework of the OST. Instead, the debate will be resolved through normative efforts in the form of unilateral national laws or, preferably, renewed action at the international level at the United Nations.¹³⁸

IV. COMPATIBILITY OF THE SREU ACT WITH INTERNATIONAL OBLIGATIONS

Utilizing the existing legal framework of international space law and the treaty interpretation rules and hierarchy discussed in Part III, this

¹³³ Outer Space Treaty, *supra* note 14, art. XIII, 18 U.S.T. at 2418–19, 610 U.N.T.S. at 211.

¹³⁴ Vienna Convention, *supra* note 113, art. 66(a), 1155 U.N.T.S. at 348.

¹³⁵ Richard Gardiner, *The Vienna Convention Rules on Treaty Interpretation*, in *The Oxford Guide to Treaties* 475, 492 (Duncan B. Hollis ed., 2012); see also Jean Galbraith, *What Should the Restatement (Fourth) Say About Treaty Interpretation?*, 2015 *BYU L. Rev.* 1499, 1508–10 (2015) (discussing Gardiner’s viewpoint and providing additional evidence of flexible application of the Vienna Convention treaty-interpretation rules despite narrow reading by the Restatement (Third)).

¹³⁶ Galbraith, *supra* note 135, at 1510–11.

¹³⁷ *Id.* at 1511.

¹³⁸ See discussion *infra* Section IV.C.

Part approaches the question of compatibility between the SREU Act and the international obligations of the United States as a court of law would. First, Section A determines the baseline international obligations of the United States as set forth by the OST. Second, Section B analyzes the compatibility of the new SREU Act with these obligations. Finally, Section C discusses the implications of this court-like analysis and practical shortcomings of the SREU Act.

A. Determining the United States' International Treaty Obligations Under the Outer Space Treaty

Because a treaty does not legally bind the United States until consented to by a two-thirds vote in the Senate and ratified by the President, the conservative scope of U.S. international obligations with respect to outer space can be limited to those put forth and agreed upon in the OST.¹³⁹ Additionally, some find the SREU Act controversial simply on the grounds that the United States passed legislation regarding activities in space, an area arguably beyond national jurisdiction.¹⁴⁰ While the United States has had national space laws since 1984,¹⁴¹ laws in the past focused on activities more arguably falling within the scope of national jurisdiction, such as space launches from the United States and licensing,¹⁴² rather than activities such as mining that actually occur in space and are governed by international law.¹⁴³ Nevertheless, others find the language of the Treaty extremely ambiguous and argue the new law falls within the permissible gaps of the ambiguity.¹⁴⁴ Such scholars urge that the terms of the OST should be liberally construed to allow as many uses of outer space as imaginable until the international

¹³⁹ See U.S. Const. art. II, § 2, cl. 2; *id.*, art. VI, cl. 2.

¹⁴⁰ See, e.g., Fox, *supra* note 112, at 168.

¹⁴¹ See Commercial Space Launch Act of 1984, Pub. L. No. 98-575, 98 Stat. 3055 (1984) (prior to various amendments in 1988, 1998, and 2004).

¹⁴² See Randolph, *supra* note 10 (providing an historical overview of U.S. domestic space law).

¹⁴³ See, e.g., Outer Space Treaty, *supra* note 14, arts. IV, 18 U.S.T. at 2413, 610 U.N.T.S. at 208 (use of nuclear weapons in space), V, 18 U.S.T. at 2414, 610 U.N.T.S. at 208–09 (treatment of astronauts in space), IX, 18 U.S.T. at 2416, 610 U.N.T.S. at 209–10 (principles guiding exploration and use of outer space), and XII, 18 U.S.T. at 2418, 610 U.N.T.S. at 211 (governance of visitation of stations, installations, equipment, and vehicles on the Moon and other celestial bodies).

¹⁴⁴ Lintner, *supra* note 55, at 140–41, 147.

community explicitly agrees to restrict certain activities, as it has done, for example, with the use of nuclear weapons.¹⁴⁵

None of the numerous binding or nonbinding bilateral and multi-lateral agreements, treaties, or United Nations resolutions regarding space explicitly addresses the exploitation of natural space resources for commercial purposes.¹⁴⁶ Nevertheless, Articles I and II of the OST shed light on the legality of claiming property rights in space resources. In fact, much of the debate regarding the matter arises due to the tension between these two articles with respect to property rights over the natural resources of the moon and other celestial bodies.¹⁴⁷ On the one hand, Article I grants a seemingly broad right for all to explore and use outer space, including the moon and other celestial bodies.¹⁴⁸ The term “use” itself may encompass the right to use, extract, and exploit the natural resources.¹⁴⁹ On the other hand, Article II lays down a strict prohibition against national appropriation of outer space “by claim of sovereignty, by means of use or occupation, or by any other means.”¹⁵⁰ Such a prohibition may prohibit claims of property rights in both real property, such as claiming a plot of land on the Moon, and personal property, such as claiming extracted mineral resources from the surface or subsurface of the Moon or an asteroid. Though the Treaty does not directly address the actions of nongovernment actors, this prohibition against appropriation likely applies to such actors given the common understanding that the Treaty governs both sovereign states and their entities and individuals.¹⁵¹

¹⁴⁵ Id. at 144.

¹⁴⁶ Shackelford, *supra* note 111, at 143.

¹⁴⁷ See, e.g., Johnson, *supra* note 111, at 1486.

¹⁴⁸ Outer Space Treaty, *supra* note 14, art. I, 18 U.S.T. at 2412–13, 610 U.N.T.S. at 207–08.

¹⁴⁹ See, e.g., H.R. Rep. No. 114-153, at 7 (2015) (“[R]emoval is permitted by the article contained in the 1967 *Outer Space Treaty* which states, inter alia, that ‘Outer Space, including the Moon and other celestial bodies, shall be free for exploration and use by all States’”) (internal quotations omitted) (quoting letter from Secretary of State Cyrus Vance to Sen. Frank Church, Chairman of Senate Foreign Relations Committee (Nov. 28, 1979)).

¹⁵⁰ Outer Space Treaty, *supra* note 14, art. II, 18 U.S.T. at 2413, 610 U.N.T.S. at 207–08.

¹⁵¹ Because Article VI of the OST requires a state party to be responsible for all state activities and activities of their nationals in outer space, non-governmental actors are confined to acting pursuant to the authorization and supervision of the state, which may only authorize and supervise activities that comply with the Treaty. Lyall & Larsen, *supra* note 86, at 66.

In addition to the nonappropriation principle, the common heritage of mankind doctrine possibly prohibits the unilateral grant of property rights in space resources without some sort of sharing mechanism. Article I of the Treaty states that “[t]he 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.*”¹⁵² Many developing nations cite this language as an invocation of the common heritage of mankind principle, which requires the sharing of all benefits extracted from a commons.¹⁵³ Today, however, the consensus seems to be that the language of Article I does not create a mandatory obligation that restricts property rights in space in a meaningful way.¹⁵⁴ Thus, this Note focuses on the interpretation of the tension between the Treaty’s general grant of the right to use space and its non-appropriation principle. Like a court, this Note first considers the ordinary meaning of the relevant terms, and second, considers additional materials such as preparatory materials, historical context, state practice, and state interpretations. Despite the ambiguities revealed by each of these interpretive tools, the great weight of the analysis favors a conclusion that the SREU Act is incompatible with the obligations set forth in the OST.

1. Ordinary Meaning

As required by Article 31 of the Vienna Convention and encouraged by many American courts, Treaty terms should first and foremost be

¹⁵² Outer Space Treaty, *supra* note 14, art. I, 18 U.S.T. at 2412, 610 U.N.T.S. at 207 (emphasis added).

¹⁵³ Fountain, *supra* note 111, at 1762; see also Zell, *supra* note 111, at 495–503 (discussing the interpretation of the common heritage of mankind language in other treaties by developing nations and providing a comprehensive overview of the International Seabed Authority, an authority intended to share the benefits of the sea with all).

¹⁵⁴ See, e.g., Lyall & Larsen, *supra* note 86, at 64 (finding it “inappropriate” to interpret Article I as “implying at that stage the existence of the notion of a regime of ‘common heritage’”); U.S. Human Exploration Goals and Commercial Space Competitiveness: Hearing Before the Subcomm. on Space, Sci., and Competitiveness of the S. Comm. on Com., Sci., and Transp., 114th Cong. 64 (2015) (response to written questions submitted by Hon. Bill Nelson to Dr. Scott Page, Director of Space Policy Institute) (stating that the United States does not accept such an interpretation of Article I and that the U.S. State Department’s Office of the Legal Advisor can confirm so); S. Exec. Doc. No. 90-8, at 4 (1967) [hereinafter OST S. Exec. Rep.] (noting that “the committee was assured that no such specific treaty obligations would result” from the language of Article I).

read in light of the ordinary meaning of the terms within the four corners of the document.

With respect to the availability of resource property rights under the OST, the key words are “use” and “appropriation” found in Articles I and II, respectively. The following sources will aid in the ordinary meaning interpretation: (1) Webster’s New International Dictionary of the English Language, 1960;¹⁵⁵ (2) Black’s Law Dictionary, 1968;¹⁵⁶ and, (3) West’s Words and Phrases, discussing cases from various time periods.¹⁵⁷ Sources from the time period of the negotiation, drafting, and ratification of the OST are utilized in attempts to accurately interpret the Treaty and its meaning at the time of its adoption. Although these sources shed some light on the potential scope of the obligations of the OST related to property rights, the analysis ultimately highlights the high level of ambiguity of the text on its face—i.e., that the ordinary meaning of the text could be read to either allow or prohibit property rights—and the need to turn to supplementary materials to aid in the interpretation.

Use. Webster’s defines “use” in myriad ways. In the way most relevant to the Treaty, “use” includes the “[a]ct of employing anything” and “[t]he fact of being used or employed habitually.”¹⁵⁸ The verb sense of “use” can also mean “[t]o convert to one’s service; to avail oneself of; to employ” (e.g., “to *use* a plow, a chair, a book”); “[t]o put into operation; to cause to function” (e.g., “he *used* the same machinery”).¹⁵⁹ The Supreme Court has found “use” to mean to “put to use, to employ, or to derive service from.”¹⁶⁰ While these definitions of “use” surely seem to encompass the extraction of natural resources to utilize as fuel, building supplies, and nutrients for one’s own purposes while in outer space, none of these definitions strongly assert the right to large-scale harvest of natural resources for commercial sale. If such an action were desired, the drafters of the Treaty might have used a stronger word such as “exploitation,” the ordinary meaning of which seems to go beyond

¹⁵⁵ Webster’s New International Dictionary of the English Language (2d ed. 1960) [hereinafter Webster’s].

¹⁵⁶ Black’s Law Dictionary (4th ed. 1968).

¹⁵⁷ Words and Phrases (West perm. ed. 2004) [hereinafter Words & Phrases].

¹⁵⁸ Webster’s, *supra* note 155, at 2806.

¹⁵⁹ *Id.*

¹⁶⁰ 43B Words & Phrases 142 (West perm. ed. 2006) (quoting *Astor v. Merritt*, 111 U.S. 202 (1884)).

mere use: “[t]o utilize; to make available; to get the value or usefulness out of; as in, to *exploit* a mine.”¹⁶¹ Furthermore, the Treaty aligns use with “exploration” in Article I, a term which ordinarily connotes “the activity undertaken to ascertain existence, location, extent or quality of a mineral deposit” when used in the mining context, a pre-exploitation phase.¹⁶² When read in light of its companion term “exploration,” the ordinary meaning of “use” does not seem to rise to the level of commercial exploitation.¹⁶³ Nevertheless, a colorable argument in favor of “use” encompassing a bundle of property rights including commercial exploitation of resources still exists, as the ordinary meaning of the term “use” “can be interpreted to encompass both non-economic and economic use.”¹⁶⁴ As indicated by the back-and-forth of this analysis, however, an ordinary-meaning analysis fails to resolve the ambiguities concerning the “use” of outer space in Article I.

Appropriation. The term “appropriation” also remains ambiguous. Webster’s defines the verb “appropriate” as “to take to oneself in exclusion of others; to claim or use as by an exclusive or pre-eminent right; as, let no man *appropriate* a common benefit.”¹⁶⁵ Similarly, Black’s Law Dictionary describes “appropriate” as an act “[t]o make a thing one’s own; to make a thing the subject of property; to exercise dominion over an object to the extent, and for the purpose, of making it subserve one’s own proper use or pleasure.”¹⁶⁶ Oftentimes, appropriation refers to the setting aside of government funds, the taking of land for public purposes, or a tort of wrongfully taking another’s property as one’s own. The term appropriation is often used not only with respect to real property but also with water. According to U.S. case law, a person

¹⁶¹ Webster’s, *supra* note 155, at 898 (defining exploitation by reference to mining).

¹⁶² 15B Words & Phrases 177 (West perm. ed. 2004) (citing *Santa Fe Pac. R.R. Co. v. United States*, 378 F.2d 72, 76 (7th Cir. 1967)); see also *id.* at 177–78 (“[E]xploration’ refers solely to effort to find additional tonnage and consists almost exclusively of . . . drilling and sampling, whereas . . . ‘development’ refers to steps necessarily taken to reach ore in mine so that it can be mined . . .” (citing *State Tax Comm’n v. Eagle Picher Mining & Smelting Co.*, 241 P.2d 804, 808 (Ariz. 1952))); Webster’s, *supra* note 155, at 898 (describing exploration as the act of searching or seeking in order to discover).

¹⁶³ While the use of the conjunctive “and” in Article I does suggest the terms should be read similarly, in light of additional language about scientific investigation, the conjunctive “and” might also suggest that “use” should be read as adding something additional to exploration, i.e., it must mean something different to avoid surplusage.

¹⁶⁴ Tronchetti, *supra* note 15, at 7.

¹⁶⁵ Webster’s, *supra* note 155, at 133.

¹⁶⁶ *Appropriate*, Black’s Law Dictionary, *supra* note 156, at 131.

completes an appropriation of water by diversion of the water and an application of the water to beneficial use.¹⁶⁷ This common use of the term “appropriation” with respect to water illustrates two key points: (1) the term applies to natural resources—e.g., water or minerals—not just real property, and (2) mining space resources and putting them to beneficial use—e.g., selling or manufacturing the mined resources—could reasonably be interpreted as an “appropriation” of outer space. While the ordinary meaning of “appropriation” reasonably includes the taking of natural resources as well as land, whether the drafters and parties to the OST envisioned such a broad meaning of the term remains difficult to determine with any certainty. The prohibition against appropriation “by any other means” supports such a reading, though, by expanding the prohibition to other types not explicitly described.¹⁶⁸

As illustrated by this analysis, considerable ambiguity remains after this ordinary-meaning analysis and thus, the question of Treaty obligations and property rights remains unresolved. In order to resolve these ambiguities, an analysis of preparatory materials, historical context, and state practice follows.

2. *Preparatory Materials*

A review of meeting reports of the Committee on the Peaceful Uses of Outer Space and its Legal Sub-Committee regarding the Treaty reveals little to clear up the ambiguities of Articles I and II of the OST. In fact, the reports indicate that, despite several negotiating states expressing concern about the lack of clarity with respect to the meaning of “use” and the scope of the non-appropriation principle, no meaningful discussion occurred and no consensus was reached.¹⁶⁹ Some commentators still conclude that the preparatory work does in fact confirm the drafters’ intent for “use” to include exploitation.¹⁷⁰ These commentators do admit, however, that discussions of the term

¹⁶⁷ 3B *Words & Phrases* 429 (West perm. ed. 2007) (citing *Nebraska v. Wyoming* 325 U.S. 589, 614 (1945); *Arizona v. California*, 298 U.S. 558, 565–66 (1936)).

¹⁶⁸ *Outer Space Treaty*, supra note 14, art. II, 18 U.S.T. at 2413, 610 U.N.T.S. at 208.

¹⁶⁹ See infra notes 172–76 and accompanying text.

¹⁷⁰ Johnson, supra note 111, at 1504 & n.159 (citing Carl Q. Christol, *The Modern International Law of Outer Space* 38–43 (1982)); see also id. at 1501 (arguing that Article II was intended to prevent territorial claims so that equal access and use would not be frustrated and thus, “use” reasonably allows for exploitation as Article I does not limit such activity).

“exploitation” supporting their conclusion focused on remote sensing and communications satellites rather than on resource extraction.¹⁷¹ Further skepticism about such an intent for “use” to include “exploitation” also arises given the uncertainty amongst negotiating states about the meaning of these terms. A mere few months before the Treaty opened for signature in January 1967, negotiators were still asking questions about the meaning of “use” during the last few Legal Sub-Committee meetings. For example, in July 1966, the representative of France inquired: “Did the latter term [“use”] imply use for exploration purposes, such as the launching of satellites, or did it mean use in the sense of exploitation, which would involve far more complex issues?”¹⁷² The representative noted that while some activities such as extraction of minerals were difficult to imagine presently, “[i]t was important for all States, and not only those engaged in space exploration, to know exactly what was meant by the term ‘use.’”¹⁷³ In the same meeting, the representative from the USSR offered an interesting response to the question posed by the representative of France:

[A]dequate clarification was to be found in article II of the USSR draft, which specified that outer space and celestial bodies should not be subject to national appropriation by means of use or occupation, or by any other means. *In other words no human activity on the moon or any other celestial body could be taken as justification for national appropriation.*¹⁷⁴

This response implies that Article II acts as a qualification on Article I’s broad provision for free exploration and use of outer space by all. Activity such as resource extraction would be viewed as national appropriation and such activity cannot be justified given Article II’s prohibition, not even by falling within the ordinary meaning of “use.” Despite this clarification, uncertainty appears to have remained, as lingering concerns were communicated in subsequent meetings by several other states, including Australia, Austria, and France.¹⁷⁵

¹⁷¹ Id. at 1505 n.159 (citing Christol, *supra* note 170, at 38–43).

¹⁷² U.N. GAOR, 5th session, 63rd mtg. at 8, U.N. Doc. A/AC.105/C.2/SR.63 (Oct. 20, 1966) (statement of Mr. Deleau, representative of France).

¹⁷³ Id.

¹⁷⁴ Id. at 10 (statement of Mr. Morozov, representative of the Union of Soviet Socialist Republics) (emphasis added).

¹⁷⁵ U.N. GAOR, 5th Sess., 70th mtg. at 14, U.N. Doc. A/AC.105/C.2/SR.70 (Oct. 21, 1966) (statement of Mr. Lemaitre, representative of France) (discussing continued

Nevertheless, the committee put the Treaty in front of the General Assembly two months later without final resolution of the ambiguities regarding property rights arising from Articles I and II.¹⁷⁶ The preparatory materials ultimately fail to fully clarify the ambiguities of the meanings of “use” and “appropriation.” The statement of the representative of the Soviet Union, one of the two main drafting parties, does, however, help push back on the interpretation of some academics that the nonappropriation principle fails to overcome the presumption of freedom of use.¹⁷⁷

3. *Historical Context*

Two interrelated, major historical events cannot be ignored when considering the meaning of the OST: (1) the Cold War and (2) the Space Race. The success of Sputnik I in 1957 showed space travel and exploration no longer to be a dream, but a reality.¹⁷⁸ While exciting, this news also brought fear in light of the world’s fragile balance of power and tensions between the United States and the Soviet Union.¹⁷⁹ What if the Soviet Union managed to launch a nuclear weapon into space? What if the United States greedily claimed the Moon as the fifty-first state? To many, the combination of the Cold War and Space Race made the late

reservations of the French delegation about “the inclusion of the word ‘use’ since it was very difficult to cover exploration and use to the same degree at the present time”); U.N. GAOR, 5th Sess., 71st mtg. at 10, U.N. Doc. A/AC.105/C.2/SR.71 and Add.1 (Oct. 21, 1966) (statement of Mr. Herndl, representative of Austria) (noting that the “idea of non-appropriation was [a] little vague”); *id.* at 14–15 (statement of Sir Kenneth Bailey, representative of Australia) (emphasizing the importance of ensuring intentions were clearly expressed in the drafting of Article II and agreeing with the French delegation that “the present text did not make it clear that outer space was not subject to national sovereignty and that no one could acquire property rights in outer space”).

¹⁷⁶U.N. GAOR, 21st Sess., 1499th plen. mtg. at 66, 71–72, 13–15 U.N. Doc. A/PV.1499 (Dec. 19, 1966) (taking votes on draft resolutions despite laments from the representative of Tanzania, Mr. Malecela, echoing concerns of Australia, Austria, and France, that asking the General Assembly to commend the draft Treaty should have been deferred “until the Committee on the Peaceful Uses of Outer Space had made greater progress in the study of . . . the definition of outer space and the utilization of outer space and the celestial bodies”).

¹⁷⁷For an example of such an interpretation, see Johnson, *supra* note 111, at 1504–07, 1513.

¹⁷⁸Lyall & Larsen, *supra* note 86, at 3.

¹⁷⁹Tennen, *supra* note 111, at 803–04.

1950s and the 1960s a perilous time.¹⁸⁰ When viewed as a response to this perilous era, the OST begins to look much more like a nuclear arms treaty and an attempt to ease Cold War tensions than a treaty concerned with the issue of property rights in space.¹⁸¹ The Treaty's emphasis on "peaceful purposes" supports this contextual interpretation.¹⁸²

On the one hand, as many suggest, this context leads to the conclusion that the vague nonappropriation principle of Article II does not prevent private property rights in space resources and the presumption of broad "use" prevails.¹⁸³ Private property rights were simply not a concern of the Treaty drafters and therefore, the Treaty does not address—nor prohibit—such claims. On the other hand, the context surrounding the treaty's drafting does not necessarily lead to this conclusion. In fact, the emphasis on "peaceful purposes" and reducing international tension might instead suggest a stricter reading of Articles I and II. If things were so unstable and tense on Earth, the drafters may have instead intended Article II as a qualification on the general right to explore and use outer space in Article I, recognizing the simple fact that disputes over property, both land and minerals, have sparked some of history's bloodiest conflicts.

The Antarctic treaty experience evidences Cold War concern over potential resource rights disputes. Leading up to the finalization of the Antarctic Treaty of 1959,¹⁸⁴ seven nations had already made official territorial claims over varying portions of the frozen landscape in hopes of laying claim to the plethora of resources thought to be located within the subsurface.¹⁸⁵ Although the Treaty itself did not directly address

¹⁸⁰ See, e.g., Johnson, *supra* note 111, at 1507–08; Fountain, *supra* note 111, at 1753–54 & n. 4.

¹⁸¹ Herron, *supra* note 48, at 559. For further discussion of the Cold War tensions during the Space Race, see, e.g., Johnson, *supra* note 111, at 1507–08, 1513; Glenn Harlan Reynolds, Who Has the Right to Mine an Asteroid?, *Popular Mechanics* (Mar. 26, 2013), <http://www.popularmechanics.com/space/a12434/who-has-the-right-to-mine-an-asteroid-15265082/> [<https://perma.cc/TW9W-DSNS>].

¹⁸² Outer Space Treaty, *supra* note 14, at pmbl. & art. IV, 18 U.S.T. at 2411, 2413–14, 610 U.N.T.S. at 207–08.

¹⁸³ See, e.g., Johnson, *supra* note 111, at 1513; Reynolds, *supra* note 181.

¹⁸⁴ Antarctic Treaty, Dec. 1, 1959, 12 U.S.T. 794, 402 U.N.T.S. 71 [hereinafter Antarctic Treaty of 1959].

¹⁸⁵ See Lyall & Larsen, *supra* note 86, at 55–56; Fountain, *supra* note 111, at 1769–70 (discussing the valuable natural resources of Antarctica and the motivations behind the Antarctic Treaty).

rights to mineral resources in the Antarctic,¹⁸⁶ the treaty is interpreted to have frozen these claims in the interest of “[f]reedom of scientific investigation in Antarctica and cooperation toward that end.”¹⁸⁷ In a manner notably similar to the terms of Articles XI and XII of the OST, the Treaty promotes scientific exploration by encouraging information sharing of scientific program plans, personnel, and observations¹⁸⁸ and inspection of stations on a reciprocal basis.¹⁸⁹ This Treaty along with several later treaties and protocols constitute the “Antarctic Treaty System,” which as a whole manages the governance of Antarctica.¹⁹⁰ In 1991, the Protocol on Environmental Protection to the Antarctic Treaty¹⁹¹ (“Madrid Protocol”) settled the question of property rights for the fifty years following the Protocol’s entry into force.¹⁹² The Madrid Protocol provides for “the comprehensive protection of the Antarctic environment . . . [and] designate[s] Antarctica as a natural reserve, devoted to peace and science.”¹⁹³ Article 7 explicitly—and simply—states “[a]ny activity relating to mineral resources, other than scientific research, shall be prohibited.”¹⁹⁴ Though Article 25 allows for the creation of a binding legal regime to determine whether and under what conditions mineral resource activity be allowed, no such international legal regime has been created to date.¹⁹⁵ The ban on mineral resource exploitation may only be amended by unanimous consent of the

¹⁸⁶ Antarctic Treaty of 1959, *supra* note 184, art. IV, 12 U.S.T. at 796, 402 U.N.T.S. at 74; Lyall & Larsen, *supra* note 86, at 56.

¹⁸⁷ See Lyall & Larsen, *supra* note 86, at 55–56.

¹⁸⁸ Antarctic Treaty of 1959, *supra* note 184, art. III, 12 U.S.T. at 796, 402 U.N.T.S. at 74.

¹⁸⁹ *Id.*, art. VII, 12 U.S.T. at 797, 402 U.N.T.S. at 76.

¹⁹⁰ Fountain, *supra* note 111, at 1770, 1770 n.118.

¹⁹¹ Protocol on Environmental Protection to the Antarctic Treaty, Oct. 4, 1991, 30 I.L.M. 1455 (entered into force Jan. 14, 1998) [hereinafter Madrid Protocol].

¹⁹² *Id.*, arts. 7 & 25, 30 I.L.M. at 1464, 1469. While disagreement may have continued over the question of property rights in resources in Antarctica, the protocol seemingly settled the question by flatly prohibiting any nonscientific mining activity for the next fifty years, or until the states created a binding legal regime to manage the resources. One attempt was made to create such a regime, but it ultimately failed. See Reaven, *supra* note 64, at 246 (“CRAMRA was convened to establish an international mining regime, only to unsuccessfully conclude in 1988 after six years of negotiation.”).

¹⁹³ *Id.*, art. 2, 30 I.L.M. at 1462.

¹⁹⁴ *Id.*, art. 7, 30 I.L.M. at 1464.

¹⁹⁵ *Id.*, art. 25, para. 5, 30 I.L.M. at 1470; Secretariat of the Antarctic Treaty, Related Agreements, http://www.ats.aq/e/ats_related.htm (last visited Jan. 20, 2018) (indicating the most recent agreement making up the Antarctic Treaty System was the Madrid Protocol itself).

parties.¹⁹⁶ The United States signed and ratified both the Antarctic Treaty of 1959 and the Madrid Protocol.¹⁹⁷

The freezing of territorial claims in the Antarctic¹⁹⁸ by the Antarctica Treaty of 1959¹⁹⁹ illustrates the existence of true concern over potential resource dispute and conflict during the Cold War, in addition to the major concerns posed by nuclear weapons.²⁰⁰ The drafting states also recognized the potential for conflict over property in outer space and drew on the language of the Antarctic Treaty of 1959 to draft the OST.²⁰¹ Given these driving concerns, Article II could be reasonably read as qualifying Article I's general rule. Under this reading, Article II serves the same qualifying purpose as Article IV regarding military and nuclear weapon use in space. Some might push back on this interpretation by claiming that the drafters could have used language such as that in the Madrid Protocol to explicitly prohibit mining in space. However, this argument is flawed. The Madrid Protocol was not written until well after both the original Antarctic Treaty of 1959 and the OST. Furthermore, the timing of the Madrid Protocol perhaps provides further evidence that resources in space are not to be harvested until a subsequent agreement regarding rights over them can be agreed upon *internationally*. While the historical context does leave some ambiguity

¹⁹⁶ Madrid Protocol, *supra* note 191, art. 25, para. 1, 30 I.L.M. at 1469; Antarctic Treaty of 1959, *supra* note 184, art. XII, para. 1(a)–(b), 12 U.S.T. at 799, 402 U.N.T.S. at 82.

¹⁹⁷ See U.S. Dep't of State, Treaties in Force: A List of Treaties and Other International Agreements of the United States in Force as of Jan. 1, 2016 (2016), <https://www.state.gov/documents/organization/267489.pdf>.

¹⁹⁸ Lyall & Larsen, *supra* note 86, at 55–56.

¹⁹⁹ Antarctic Treaty of 1959, *supra* note 184, art. VII, 12 U.S.T. at 797, 402 U.N.T.S. at 76.

²⁰⁰ *Id.*, art. I (providing that Antarctica shall be used for peaceful purposes only and prohibiting any military bases or maneuvers, as well as any weapons testing in the region); *id.*, art. V (prohibiting nuclear explosions); Fountain, *supra* note 111, at 1770 (“Motivated by concerns to protect the fragile Antarctic environment, to preserve the area for scientific research, and to avoid potential sovereignty disputes arising from pre-existing claims, the United States initiated discussions with the other countries engaged in active research in Antarctica.”) (citing Grier C. Raclin, *From Ice to Ether: The Adoption of a Regime to Govern Resource Exploitation in Outer Space*, 7 *Nw. J. Int'l L. & Bus.* 727, 745–46 (1986)).

²⁰¹ See Lyall & Larsen, *supra* note 86, at 180–81 (discussing that President Eisenhower formally expressed the view that the Antarctica Treaty of 1959 should be used as a model for creating an outer-space legal regime); Fabio Tronchetti, *The Exploitation of Natural Resources of the Moon and Other Celestial Bodies: A Proposal for a Legal Regime* 136 (2009) (“The [Antarctic] Treaty’s provisions . . . also largely contributed to the development of other fields of international law and influenced the drafting of some successive legal texts such as, for example, the Outer Space Treaty.”).

as to whether the OST permits property rights over space resources, the Antarctic experience provides a compelling analogy and suggests that the OST does not allow for property rights in space resources.

4. *State Practice*

In its Frequently Asked Questions released about the SREU Act, the House Committee on Science, Space, and Technology forcefully asserted that the Act does not violate international law.²⁰² In fact, according to the committee, the Act's provision of property rights "is affirmed by State practice and by the U.S. State Department in [c]ongressional testimony and written correspondence."²⁰³ Proponents of this view base their beliefs on several examples. One, "no serious objection" arose to the United States and the Soviet Union bringing samples of rocks and other materials from the Moon back by manned and robotic missions in the late 1960s, nor to Japan successfully collecting a small asteroid sample in 2010.²⁰⁴ Two, a practice of respecting ownership over such retrieved samples and a terrestrial market for such items exists, as illustrated by the fact that no one doubts that the American Museum of Natural History "owns" three asteroids found in Greenland by arctic explorer Robert E. Peary that are now part of the museum's Arthur Ross Hall of Meteorites.²⁰⁵ Three, Congressmen also cite to a federal district court case, *United States v. One Lucite Ball Containing Lunar Material*,²⁰⁶ to illustrate state practice in favor of ownership over spaces resources. The case involved an Apollo lunar sample gifted to Honduras by the United States. The sample was stolen and sold to an individual in the United States.²⁰⁷ When caught during a

²⁰² H. Comm. on Sci., Space, and Tech., *The Facts Behind SPACE Act – Frequently Asked Questions*, http://science.house.gov/sites/republicans.science.house.gov/files/documents/SPACE_FAQ_0.pdf [<https://perma.cc/B65K-AUWZ>] (last visited November 14, 2017) [hereinafter *SPACE Act FAQ*]; see also H.R. Rep. No. 114–153, at 8 (2015) (also asserting that taking possession of outer-space resources is consistent with the OST).

²⁰³ *SPACE Act FAQ*, supra note 202.

²⁰⁴ Tennen, supra note 111, at 811; NASA., supra note 34; see also H.R. Rep. No. 114–153, at 8 (2015) (discussing that the United States, Russia, and Japan have all "removed, taken possession, and used in-situ natural resources").

²⁰⁵ Lyall & Larsen, supra note 86, at 197.

²⁰⁶ 252 F. Supp. 2d 1367 (S.D. Fla. 2003); see also H.R. Rep. No. 114–153, at 8 (2015) (citing *United States v. One Lucite Ball Containing Lunar Material*, 252 F. Supp. 2d 1367 (2003)).

²⁰⁷ *One Lucite Ball*, 252 F. Supp. 2d at 1369.

sting operation intended to uncover illegal sales of imposter samples, the buyer was forced to forfeit the lunar sample after the court concluded the moon rocks had in fact been stolen, basing its decision in part on its recognition of Honduras having national property ownership over the sample.²⁰⁸

These examples appear overwhelming, but they are not actually examples of activities of the same “form and content” that the SREU Act approves.²⁰⁹ These examples all involve collection of samples in *limited* amounts and for *scientific* purposes, while the SREU Act approves *large-scale* collection and for *commercial* exploitation. The OST explicitly emphasizes a “freedom of scientific investigation in outer space,” and the collection of scientific samples reasonably fall under this enumerated right.²¹⁰ Alternatively, the OST says nothing with respect to commercial exploitation, only discussing “benefits” of space in terms of sharing those benefits with all mankind.²¹¹ Furthermore, the American Museum of Natural History and *Lucite Ball* examples relied upon are misleading because they suggest that types of celestial artifacts found or gifted on Earth are subject to the same legal regime as resources mined or collected in space, which may not necessarily be true. The analogy of ownership over fish extracted from the high seas is also often cited in response to this pushback. Much like outer space, the high seas are open to all participants, yet the law of the seas still recognizes the right to title over fish extracted on the high seas by fishermen, who can then sell the fish.²¹² But again, this analogy has limited import because both the 1958 Geneva Convention on the High Seas and the United Nations Convention on the Law of the Sea (“UNCLOS”) explicitly recognize the right to fish, while the OST grants no such right to exploit space resources.²¹³

²⁰⁸ *Id.* at 1374–76.

²⁰⁹ Tronchetti, *supra* note 15, at 8.

²¹⁰ Outer Space Treaty, *supra* note 14, art. I, 18 U.S.T. at 2413, 610 U.N.T.S. at 208.

²¹¹ *Id.*, art. I, 18 U.S.T. at 2412–13, 610 U.N.T.S. at 207–08. (discussing the exploration and use of space for the “benefit” of all mankind and the “freedom of scientific investigation”).

²¹² Lyall & Larsen, *supra* note 86, at 197.

²¹³ United Nations Convention on the Law of the Sea art. 116, Dec. 10, 1982, 1833 U.N.T.S. 441; Geneva Convention on the High Seas art. 2, April 29, 1958, 13 U.S.T. 2314, 450 U.N.T.S. 82–84. The United States signed UNCLOS, but has yet to ratify it despite support of several presidential administrations. Shackelford, *supra* note 111, at 128–29. Nevertheless, United Nations records note the United States as one of the states that

Furthermore, state practice relevant to the question of property rights under the OST goes beyond these examples and analogies of ownership of resources taken from commons. State practice regarding property rights in general must be considered. For example, Professor Fabio Tronchetti disagrees with the oft-cited notion that state practice affirms the SREU Act.²¹⁴ According to the professor, “under international law, property rights require a superior authority, a State, entitled to attribute and enforce them.”²¹⁵ By granting property rights in the SREU Act, the United States impliedly claims that it has the authority to confer property rights over space resources—an authority traditionally reserved for the owner of a resource. This notion clashes with the nonappropriation principles of the OST. Though there is no consensus regarding whether the nonappropriation principle prohibits claims of sovereignty over resources, a strong consensus at least exists that the principle prohibits states from claiming sovereignty over real property in space.²¹⁶ In some traditional systems of mineral ownership, however, ownership over resources ran with ownership over land.²¹⁷ For example, under Roman law, property rights over subsurface minerals belonged to the landowner.²¹⁸ Thus, if the United States cannot have title in space lands under the nonappropriation principle, it cannot have title to the space resources in those lands either. Without title to the resources, the United States cannot bestow such title to its citizens under traditional international property law; by claiming that it can bestow such title, the United States is abrogating Article II of the OST. One could also argue that the in situ resources the Act grants rights in are actually still part of the celestial bodies; thus, the resources are real property prior to their

“notified the Secretary-General of its intention to continue to participate as a member of the International Seabed Authority on a provisional basis.” UN Treaty Collection, Multilateral Treaties Deposited with the Secretary-General, Chapter XXI: Law of the Seas, at 6a, <https://treaties.un.org/doc/Publication/MTDSG/Volume%20II/Chapter%20XXI/XXI-6-a.en.pdf> (status as of Nov. 26, 2016). Dr. Sarah Jane Fox summarizes the United States’ position well: “Whilst the position of the U.S. is that it respects UNCLOS, commentators have indicated that the U.S. will always support the option that allowed it to mine the seabed.” Fox, *supra* note 112, at 172 (also discussing the customary international law status of UNCLOS).

²¹⁴ Tronchetti, *supra* note 15, at 8.

²¹⁵ *Id.*

²¹⁶ Lyall & Larsen, *supra* note 86, at 183–85.

²¹⁷ Anthony Scott, *The Evolution of Resource Property Rights*, 193–94 (2008) (describing the Greek and Roman traditional systems of mining law).

²¹⁸ *Id.* at 193.

removal, and are off limits under the Treaty.²¹⁹ Given the limited import of the cited examples of state practice (limited quantity and scientific versus large-scale and commercial), the traditional practice of property rights being conferred from a sovereign to a citizen become incredibly compelling and suggest the SREU Act may abrogate the United States' treaty obligations.

A final piece of evidence, however, again inserts ambiguity into the interpretation: the sweeping rejection of the Moon Agreement and its limitations on property rights by the international community discussed *supra* Part III.A.2. On the one hand, the rejection may imply that the international community approved of property rights. On the other hand, however, there were other reasons for the sweeping rejection. For example, Professors Francis Lyall and Paul B. Larsen claim the “main area of controversy”²²⁰ actually surrounded the Agreement's proclamation of the Moon and celestial bodies and their natural resources as the “common heritage of mankind” in Article 11.1,²²¹ rather than the Agreement's general property-right provisions. Many believed the invocation of the “common heritage of mankind” language would impart actual obligations upon parties to share extracted resources, whereas the “province of all mankind” and “for the benefit and interest of all” language of the OST did not.²²² As with ordinary meaning, preparatory materials, and historical context, state practice leaves some ambiguities and state interpretations should also be considered.

5. State Interpretations

Much like the preparatory materials discussed *supra* Part IV.A.1, subsequent state interpretation of the OST fails to fully address the question of the legality of property rights in space resources. On the one hand, the Senate Committee on Foreign Relations found that the drafters

²¹⁹ See Tronchetti, *supra* note 15, at 8, 9 n.29 (“While the legal status of resources that are removed from their initial location is debatable, that of resources that are still in their original place is not, in the sense that they cannot be appropriated. Indeed, these resources can be considered as being part of the celestial bodies to which they belong; as under Article II . . . celestial bodies are non-appropriable, the argument has been made that any conferral of property rights over asteroid natural resources in place could amount to a US ownership claim over asteroids, a behavior in adamant violation . . . of Article II and a breach of the US obligations under the treaty.”).

²²⁰ Lyall & Larsen, *supra* note 86, at 183.

²²¹ Moon Agreement, *supra* note 94, art. 11, 1363 U.N.T.S. at 25.

²²² See, e.g., *id.*; Lyall & Larsen, *supra* note 86, at 183.

intended Articles I, II, and III of the Treaty to be general in nature when reviewing the Treaty,²²³ which perhaps suggests Article II's nonappropriation principle does not qualify Article I's general right to use or act as an exception. Yet, the committee also found the Treaty to be in response to the "potential for international competition and conflict in outer space."²²⁴ To the committee, Articles I, II, and III stressed the importance of free scientific investigation, guaranteed free access to all areas of celestial bodies, and prohibited claims of sovereignty.²²⁵ Not only would property rights in natural resources potentially ignite and exacerbate conflict in space, but they also seemed somewhat incompatible with scientific investigation, free access, and the prohibition on sovereignty. During its hearing on the Treaty, the Senate Committee on Foreign Relations focused a majority of its discussion of Article I on whether or not the language "province of all mankind" imparted strict obligations, while devoting little to no time to the issue of the meaning of "use."²²⁶ Former Justice Arthur Goldberg, then U.S. ambassador to the United Nations, did note the goal of the article was to "not subject space to exclusive appropriation by any particular power."²²⁷ Nevertheless, this statement fails to resolve whether natural resources may be exploited, as such exploitation could be carried out in an inclusive manner.

The committee's review of Article II consumes only eight lines of the hearing transcript, merely adding that the Article is complementary to Article I and that space cannot be claimed for the country (likely referring to land rather than resources).²²⁸ A different exchange between Ambassador Goldberg, Senator Lausche, and the Chairman leaves further ambiguity regarding the use of natural resources in space:

Mr. Goldberg: We wanted to establish our right to explore and use outer space.

²²³ OST S. Exec. Rep., supra note 154, at 2.

²²⁴ Id.

²²⁵ Id.

²²⁶ Treaty on Outer Space: Hearing Before S. Comm. on Foreign Relations, 90th Cong. 9–21 (1967).

²²⁷ Id. at 10.

²²⁸ Id. at 21.

Senator Lausche: Yes. That is, any one of the signatory nations shall have the right to the use of whatever might be found in one of the space bodies.

Mr. Goldberg: No, no. It doesn't mean that. It means that they shall be free on their own to explore outer space.

The Chairman: Or to use it.

Mr. Goldberg: To use it.

The Chairman: But not on an exclusive basis.

Mr. Goldberg: Everyone is free.²²⁹

At first, Ambassador Goldberg appears to have refuted the notion that a signatory could simply “use” anything found in one of the space bodies, such as a mineral, implying Senator Lausche’s example exceeded the scope of Article I. He then went on to emphasize exploratory activities. But then, Ambassador Goldberg backtracked and reasserted the right to use without clarifying his initial qualification.

This sense of ambiguity remains today despite Congress signing off on the SREU Act. While sponsors of the bill and statements from resource extraction companies emphasized the broad scope of the right to “use” outer space and state practice in support of the legality of property rights,²³⁰ several expert witnesses expressed genuine concern

²²⁹ *Id.* at 65.

²³⁰ See, e.g., Exploring Our Solar System: The Asteroids Act as a Key Step: Hearing on H.R. 5063 Before the Subcomm. on Space of the H. Comm. on Sci., Space, and Tech., 113th Cong. 152 (2014) [hereinafter Asteroids Act Hearing] (letter from Deep Space Industries submitted by Subcommittee Chairman Palazzo) (arguing the Treaty prohibits claims in *real* property, but not the use of personal property; “what is not prohibited is permitted”); H.R. Rep. No. 114-153, at 7–8 (2015) (“The exploration and use of outer space includes the right to remove, take possession, and use in-situ natural resources from celestial bodies.”) (citing state department communications regarding Article 1 of the OST in 1967 and 1980; United

that obligations under the Treaty remain unclear and require additional analysis.²³¹

B. Compatibility

Employing the treaty interpretation tools of ordinary meaning, preparatory materials, historical context, state practice, and state interpretation offers many possible understandings of the obligations imparted by Articles I and II of the OST. For example, while the ordinary meaning of “use” could reasonably include the exploitation of materials, the meeting summaries of the Fifth Session of the U.N. Committee on the Peaceful Uses of Outer Space Legal Sub-Committee make clear that no consensus was ever reached regarding whether “use” includes large-scale exploitation of space resources, let alone fee-simple ownership and the ability to sell commercially. State practice dealing with extraterrestrial samples also sheds little light on the confusion, as the examples cited all deal instead with scientific samples of limited quantity. The international community’s rejection of the Moon Agreement also fails to bring clarity. While on the one hand the rejection could be read as a rejection of the idea that the OST prohibits

States v. One Lucite Ball Containing Lunar Material, 252 F. Supp. 2d 1367, 1374–75 (S.D. Fla. 2003); state practice of the United States, Russia, and Japan of retrieving space samples; NASA Office of Inspector General, *NASA’s Management of Moon Rocks and Other Astromaterials Loaned for Research, Education, and Public Display*, at v n.8 (2011) (asserting that lunar materials retrieved during the Apollo missions are government property)).

²³¹ See, e.g., Asteroids Act Hearing, *supra* note 230, at 67 (testimony of Ms. Joanne Gabrynowicz, Professor Emerita, Director Emerita, Journal of Space Law Editor-in-Chief Emerita, University of Mississippi) (“The treaty regime seems to allow private-sector entities to extract resources if those activities are consistent with international law and United States obligations. However, the ownership status of the extracted resources is unclear.”); *id.* at 78 (written statement of testimony of Ms. Joanne Gabrynowicz) (warning that political and legal challenges to its terms should be expected if adopted); *id.* at 93 (response of Dr. Jim Bell, Professor of Earth and Space Science Exploration, Arizona State University, and President, Board of Directors, The Planetary Society to Rep. Schweikert’s questions) (stating that with respect to how legal certainty of ownership may be provided in a world in which the United States has treaty obligations, “it is not clear that there is a straightforward solution but it is going to take time and it is going to have to be consistent with our international treaty obligations. So I don’t think it is going to happen quickly.”); H.R. Rep. No. 114-153, at 20 (2015) (minority views expressed in statement of Rep. Eddie Bernice Johnson) (asserting that the subcommittee is “not at all close” to resolving the issues relating to international treaty obligations and reiterating Professor Gabrynowicz’s testimony at the hearing).

private property rights, it could also be read as a rejection of the common heritage of mankind doctrine. Finally, the prospect of private-venture space mining and extraterrestrial resource extraction remained far off and futuristic at the time of the Treaty's negotiation, making drawing legal conclusions about the legality of these revolutionary activities extremely difficult.

Overall, however, the Treaty's structure and its purposes (preserving peace and avoiding international conflict in outer space) ultimately indicate that private property rights in space resources are prohibited by Article II's non-appropriation principle, at least until future *international* delegation determines otherwise (like in the Antarctic). The Treaty's structure confirms this interpretation. Article I lays down a general rule for activity in space. Subsequent articles of the Treaty then lay out more specific requirements of and qualifications to this general rule. Much like Article IV restricts the use of nuclear weapons in space, Article II restricts the use of space in ways that might result in potentially controversial property claims. Historically, claims to mineral rights have resulted in just as contentious conflict as those over sovereign lands. Treaty efforts to avoid conflicts in Antarctica and the high seas reflect similar sentiments. The Soviet Union's representative even hinted at this structural relationship between Articles I and II during Treaty negotiations.²³² In light of the imminent need to ease Cold War tensions, the potential for conflict over property, and the final structure of the Treaty, this Note concludes that the large-scale extraction of space resources is incompatible with the non-appropriation principle of Article II of the OST.²³³ As a result, the United States' provision of property rights to its citizens to possess, own, transport, use, and sell space and asteroid resources extracted through the SREU Act contravenes its international obligations established by the OST.

Despite this conclusion, some may be tempted to argue that the Act itself does not violate the OST based on a technicality of sorts. Section

²³² See *supra* note 174 and accompanying text.

²³³ But see Asteroids Act Hearing, *supra* note 230, at 75–76 (written responses of Professor Gabrynowicz) (“Taken together, the plain meaning of the word ‘use’ in all of these provisions as well as the clearest and most important treaty provisions indicates that the drafters and the signatories approved of the use, including extraction, of outer space resources. [But what] remains unclear is the ownership status of the resources when they are collected.”) (citations omitted); Johnson, *supra* note 111, at 1513 (concluding that Article II does not clearly override the right to extract mineral resources).

51303 only grants property rights in space resources “obtained in accordance with applicable law, including the international obligations of the United States.”²³⁴ Further, the required follow-up letter to the Act from the Executive Office of the President reasserted that only missions that do not violate international obligations would receive authorization.²³⁵ Thus, the argument goes that until the United States implements the Act by officially approving an asteroid-mining mission, it will not violate its international obligations. Nevertheless, this tempting technicality is premised merely on the inclusion of boilerplate lip service to the United States’ international obligations. If the United States were to fully honor its international obligations, it would have resolved any ambiguities before passing the SREU Act instead of punting the question down the road. Furthermore, international case law exists suggesting that a mere acknowledgement in a treaty by a state of a right to breach international treaty law in the future constitutes a breach in and of itself.²³⁶ Therefore, this “technicality” argument fails to alter the conclusion that the United States abrogated its international obligations when it passed the SREU Act.

²³⁴ U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, § 402, 129 Stat. 704, 720–21 (2015) (to be codified at 51 U.S.C. §§ 51301–03).

²³⁵ Office of Sci. and Tech. Policy, Exec. Office of the President, Letter Fulfilling Reporting Requirements of Pub. L. 114-90, at 6 (April 4, 2016) [hereinafter Office of Sci. and Tech. Policy Letter], https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/csla_report_4-4-16_final.pdf [<https://perma.cc/R7S6-FTD7>].

²³⁶ In the Open Skies cases, the European Court of Justice (“ECJ”) considered a tax-discrimination claim. Under the treaty between the United Kingdom and the United States, the United States had the right to deny treaty benefits based on the nationality of the taxpayer. In the proceeding, the United Kingdom argued that its law did not discriminate, but rather that the United States’ conduct gave rise to the discrimination when the United States chose whether or not to extend the benefits. The ECJ disagreed, instead viewing the United Kingdom’s acknowledgment of the United States’ right to deny the benefits in the treaty terms as discrimination in and of itself. See Case C-466/98, *Comm’n v. United Kingdom*, 2002 E.C.R. I-9427; see also Case C-467/98, *Comm’n v. Denmark*, 2002 E.C.R. I-9519; Case C-468/98, *Comm’n v. Sweden*, 2002 E.C.R. I-9575; Case C-469/98, *Comm’n v. Finland*, 2002 E.C.R. I-9627; Case C-471/98, *Comm’n v. Belgium*, 2002 E.C.R. I-9681; Case C-472/98, *Comm’n v. Luxembourg*, 2002 E.C.R. I-9741; Case C-475/98, *Comm’n v. Austria*, 2002 E.C.R. I-9797; Case C-476/98, *Comm’n v. Germany*, 2002 E.C.R. I-9855 (known collectively as the Open Skies cases).

C. Implications

While the commercial space industry may not view this conclusion with particular fondness, the industry should not necessarily view the SREU Act itself with particular fondness either. Perhaps the Act's abrogation of international obligations—arising from a decades-old, ambiguous Treaty to boot—might be justifiable or understandable to Treaty partners if the Act truly solved the legal-certainty problem plaguing private mining companies across the globe. Aside from stirring the pot by bringing attention to the issue, however, the Act fails to provide any more legal certainty to actors than does the current regime, as it lacks a crucial component: a coordinating rule.

Coordinating rules provide certainty by stipulating a straightforward rule for actors about what actions will lead to a specific legal result. For example, in the classic property case, *Pierson v. Post*,²³⁷ a property dispute resulted over the ownership of a hunted fox. The plaintiff pursued the fox with hounds, but the defendant intervened, killed the fox, and took it for himself. The plaintiff argued the traditional rule of capture resulted in his ownership over the fox, as he controlled it in pursuit. The court, however, laid down a clearer coordinating rule: capture required a mortal wounding while still in pursuit or corporal possession.²³⁸ Whether right or wrong, this coordinating rule provided individuals with the knowledge of what actions were necessary to result in property ownership and a test for courts to apply to easily resolve property disputes in the future.

The SREU Act provides no such coordinating rule. While the Act provides that property rights will arise in asteroid and space resources “obtained,” the Act fails to provide any meaningful definition for this word. Must a commercial mining company effectively occupy and use a mining site before the resources extracted from that site become theirs? Or can any actor quite literally enter a mine in the future and walk away with a resource since they have arguably “obtained” the resource? Because the OST provides free access to all of outer space, these concerns could very well come to fruition. Even though Deep Space Industries and Planetary Resources may be rejoicing that property rights are possible, considerable uncertainty remains regarding the protection of their mining sites and investment once on the surface of the asteroid.

²³⁷ 3 Cai. 175 (N.Y. Sup. Ct. 1805).

²³⁸ *Id.* at 178–79.

Unlike grants of mining rights over resources on public lands on Earth, the United States has no proposal to manage the locations of such missions or for dispute-resolution mechanisms. Its mission-approval process may be able to prevent conflict between U.S. companies, but the process does not control missions of foreign entities, nor does it clarify which agency has the authority to provide approval.²³⁹ These uncertainties illustrate that the SREU Act—though a step in the right direction—leaves much to be desired and that space-mining companies may have rejoiced too quickly.

Perhaps most frustrating, the writings of legal academia provide countless model coordinating rules and mechanisms, the inclusion of any one of which in the SREU Act would have provided a more stable and promising economic environment for the private space-mining industry and its investors, as well as a more understandable justification for abrogating international obligations.²⁴⁰ However, that would have

²³⁹ Asteroids Act Hearing, *supra* note 230, at 70 (written responses of Professor Gabrynowicz) (“Private sector asteroid resource exploration and utilization is an unprecedented enterprise. It will raise novel issues requiring a wide range of entrepreneurial, technical, economic, legal, policy, space situational awareness, and diplomatic expertise. No one agency houses all that will be needed. *Absent a clearer statement of which agency is responsible* for what kind of regulation, an unpredictable over-regulated environment that relies on ad hoc dispute resolution could be created. *It will produce unnecessary risk that is counterproductive to industry.*”) (emphasis added); Office of Sci. and Tech. Policy Letter, *supra* note 235, at 6 (failing to identify the exact scope of responsibilities of each agency).

²⁴⁰ See Coffey, *supra* note 112, at 133–47 (providing a helpful overview of several legal frameworks for resource property rights in outer space, discussing drawbacks of each and ultimately providing a new proposal); Myres S. McDougal et al., *The Enjoyment and Acquisition of Resources in Outer Space*, 111 U. Pa. L. Rev. 521, 633–34 (1963) (conducting an insightful in-depth analysis of whether various resources in outer space should be open for inclusive use or closed for exclusive use before the OST was even concluded and recommending the adoption of a system similar to those employed by many states in their allocation of domestic mineral resources and to that proposed to resolve the international Spitsbergen Island Controversy); Tennen, *supra* note 111, at 825–30 (providing a wonderful overview of alternative mechanisms for the allocation of property rights in space, including the Lunar Economic Development proposal, auctions similar to those of orbital slots, and allocation by a near-earth, object specific international authority); see also Fountain, *supra* note 111, at 1775–82 (recommending an “International Space Federation” modeled off of UNCLOS and funded through fees, which could also be used to subsidize the involvement of developing nations); Shackelford, *supra* note 111, at 112 (suggesting a modified leasehold system reminiscent of the Homestead Act); Zell, *supra* note 111, at 509–14 (proposing an international model “Space Resource Authority” reminiscent of the International Seabed Authority to manage exploitation easements and manage a unique system of royalty, fee, and minable material dedication forgiveness).

required more research—and, most importantly, more time—on the part of Congress.

In the coming months, the United States should use its leadership to encourage the adoption of a coordinating rule on the international level. Such a rule could supply the legal certainty interested parties truly desire and provide the peace of mind that the wonderful prospects of space mining will not meet their demise as a result of international conflict and competing claims. Negotiations may be difficult and time-consuming, in part because of the likely call from developing nations for some sharing mechanism, as illustrated by UNCLOS. Nevertheless, the success of the Antarctica Treaty System and the prospect of asteroid mining's exponential benefits to space exploration provide hope.

V. CONCLUSION

As shown through an in-depth treaty interpretation, the Space Resource Exploration and Utilization Act of 2015 contravenes the international obligations of the United States established by the Outer Space Treaty. Furthermore, although the Act at least resulted in the international community discussing the issue again and spurred Luxembourg to pass its own version of the law,²⁴¹ the Act at its core fails to provide any meaningful, substantive legal certainty in the form of a coordinating rule to private space companies regarding the prospect of mining asteroids in the near future. Before approving any asteroid-mining missions, the United States should use its influence and leadership to seek resolution of remaining uncertainties and develop a strong coordinating rule with the international community at large. Though respecting the rule of law, especially the international rule of law, may not always be the easiest means to a desired end, “the law is what holds the fabric of society together. Otherwise, there is chaos and anarchy.”²⁴² Entering the unknowns of deep space without such glue would be unwise.

²⁴¹ Press Release, Grand Duchy of Luxembourg, Aerospace Industry, A Legal Framework for Space Exploration (July 24, 2017), <http://www.luxembourg.public.lu/en/actualites/2017/07/21-spaceresources/index.html> [<https://perma.cc/9AUP-GR6V>].

²⁴² Hon. B. Waugh Crigler, Remarks at the University of Virginia School of Law (Dec. 7, 2016).