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Law in the Final Frontier: Ambiguities and Clarity in the Legal Regime of Outer Space

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LAW IN THE FINAL FRONTIER:
AMIBGUITIES AND CLARITY IN THE LEGAL REGIME OF OUTER SPACE

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Abstract: As the private space industry and a new, twenty-first century space race burgeons, governments around the world will be forced to confront the deficits in outer space's existing legal regime that continue to produce ambiguities that threaten humanity's ability to peacefully explore the cosmos. Space is no longer strictly the domain of governments and government personnel. In the coming decades, we will bear witness to the beginnings of the civilization of space–something the existing legal regime is not prepared to govern. The foremost reason for the current regime's inadequate is its failure to clearly expound legal jurisdiction in space, which creates room for contests of jurisdiction and renders the existence, role, and protection of private property in space uncertain. These ambiguities make justice more difficult to attain, are easily exploited by competing states by way of gray zone tactics, and threaten private investment in space. This article addresses the problems in the current legal regime of space, a common proposed solution to these problems, and the problems that exist within that solution. This article ultimately aims to raise awareness of the flaws in outer space's legal regime and calls upon policymakers to ameliorate these deficits to ensure humanity maintains a peaceful and productive use of the invaluable cosmos so that we may continue to reap its enormous benefits.

Introduction

Interest in outer space is currently enjoying an international renaissance. Reminiscent of the Cold War-era space race, the United States of America and its competitors–the People's Republic of China and the Russian Federation–are vying for international power through space exploration and space-based scientific innovation.[1] While certainly not initiating the new-age competition, the twenty-first century space race was cemented with the success of China's Chang'e

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[1] Anne McMillan, "The final frontier - 21st century space race," International Bar Association, July 14, 2021, https://www.ibanet.org/the-final-frontier.

4 mission, which, for the first time ever, landed a rover on the far side of the Moon.[2] While perhaps a great stride for humanity–and one that may help expand understanding of our Moon–this mission has alarmed the United States governments, seeing this mission as a challenge to the United States and the American-led order that has dominated space since the twilight of the Cold War. Former Vice President Mike Pence asserted that the Chang'e 4 mission "revealed [China's] ambition to seize...the strategic high ground and become the world's pre-eminent spacefaring nation."[3] In the same speech, Pence (informally) declared the beginning of a new space race and announced the ambitious acceleration of American space-exploration efforts. Not to exclude the original space race adversary, Pence also identified Russia as another modern competitor.[4] In an article for *The Washington Post*, Pence, citing a 2019 Defense Intelligence Agency report, wrote of the militarization of space, asserting that "China and Russia are aggressively developing and deploying capabilities–including anti-satellite weapons, airborne lasers, menacing 'on-orbit' capabilities and evasive hypersonic missiles."[5] While space may–in many ways–remain full of mystery, it being a domain of international competition and the spectre of its militarization are all too familiar.

While the phrase "space race" is an explicit reference to the Cold War competition between the United States and the Soviet Union, the space race of today is notably different from that of the twentieth century. Russia and the United States are now joined by not only China but another new entrant: the private space industry. Perhaps the most notable space-faring private entity is Elon Musk's SpaceX, which has embarked on a number of highly publicized initiatives since its

[2] Andrew Jones, "China's Chang'e 4 lander and rover complete 15th lunar day on moon's far side," *Space*, March 4, 2020, https://www.space.com/china-change-4-mission-completes-15th-lunar-day.html.
[3] Mike Wall, "US Is in a New Space Race with China and Russia, VP Pence Says." *Space*, March 27, 2019,. https://www.space.com/new-space-race-moon-mike-pence-says.html.
[4] Wall, "New Space Race."
[5] Wall, "New Space Race."

2002 founding and has made a name for itself with its ambitious (if not unrealistic) goals.[6] Currently, SpaceX owns what is currently the largest constellation of satellites currently in orbit as part of its Starlink initiative, which aims to provide low-cost, high-quality Internet coverage to the entire world.[7] Private involvement in space has also led to great innovation in exploration technology, namely the SpaceX-pioneered reusable launch system Falcon 9, which will significantly reduce launch costs in the future.[8] While perhaps the most visible, SpaceX is far from the only private company making inroads into space. Virgin Galactic and Blue Origin are SpaceX's most noteworthy competitors, both of which have their eyes set on private, commercial spaceflight.[9] The heads of both companies–Richard Branson and Jeff Bezos respectively–have even traveled into space themselves aboard their companies' spacecraft.[10] Perhaps most enticing is the possibility that space tourism has evolved from science fiction to an imminent reality. For the first time, humanity is looking at the credible possibility of civilians going to space for vacation.[11]

Even further down the road is the prospect of colonizing space. While space tourism may be a luxury of the near future, many believe space colonization will eventually become necessary for humanity's survival. Princeton professor and physicist Dr. Gerard O'Neill pioneered the idea of space colonization, viewing it as a means of escaping what he saw as unsustainable popular

[6] Mike Wall, "SpaceX's very big year: A 2020 filled with astronaut launches, Starship tests and more," *Space*, December 28, 2020, https://www.space.com/spacex-astronaut-starship-launches-2020-milestones.
[7] Mike Wall, "SpaceX's very big year."
[8] Justin Bachman, "New Space Race Shoots for Moon and Mars on a Budget," *Bloomberg*, November 28, 2020, https://www.bloomberg.com/news/articles/2020-11-28/new-space-race-shoots-for-moon-and-mars-on-a-budget-quicktake.
[9] Bachman, "New Space Race."
[10] Ashlee Vance, "The Future of Space Is Bigger Than Jeff Bezos, Richard Branson, or Elon Musk," *Bloomberg*, July 16, 2021, https://www.bloomberg.com/news/articles/2021-07-16/billionaire-space-race-between-bezos-branson-and-musk-is-just-the-beginning.
[11] Francesca Street, "First space tourist Dennis Tito: 'It was the greatest moment of my life'," CNN Travel, July 20, 2021, https://www.cnn.com/travel/article/space-tourism-20-year-anniversary-scn/index.html.

growth.[12] Bezos, founder of Blue Origin and a former student of Dr. O'Neill's, has expressed similar fears due to humanity's unsustainable energy consumption.[13] In a similar vein, SpaceX founder Elon Musk and the late astrophysicist Stephen Hawking have expressed support for humanity's "planetary diversification"–spreading humans out over multiple planets to protect the species from cataclysmic natural disasters that may threaten individual planets.[14] Whatever the reason may be, several world governments have begun to seriously consider the prospect of space colonization, including the United States,[15] the European Union, and China[16]. The modest (but nevertheless groundbreaking) incursions of industry titans into space is only the beginning of civilian space travel–and one day there may be humans that have never been–or even heard of–our current home we know as Earth.

The prospect of sending humans into space is entrancing, and it's easy to find oneself swept away by the cosmos' endless potential. Before humanity embarks on any such missions, however, spacefaring nations and the international community at large must address the deficit in outer space's legal regime. The first allegation of criminal activity in space was levied in 2019, when Summer Worden, while on Earth, accused her estranged (now ex) wife, astronaut Anne McClain, of illegally accessing her bank account while McClain was in space aboard the International Space Station (ISS). Fortunately, the allegation was covered by the limited legal regulations already in

[12] Monte Davis, "Gerard K. O'Neill on Space Colonies," *OMNI*, October 12, 2017, https://omnimagazine.com/interview-gerard-k-oneill-space-colonies/.
[13] Corey S. Powell, "Jeff Bezos foresees a trillion people living in millions of space colonies. Here's what he's doing to get the ball rolling," NBC News, May 15, 2019, https://www.nbcnews.com/mach/science/jeff-bezos-foresees-trillion-people-living-millions-space-colonies-here-ncna1006036#anchor-GerardONeillsfrontiervision.
[14] Christianna Reedy, "When Will the First Human Space Colony Be Established?," *Futurism*, August 17, 2017. https://futurism.com/when-will-the-first-human-space-colony-be-established.
[15] Matt Williams, "The future of space colonization–terraforming or space habitats?," *Phys*, March 10, 2017, https://phys.org/news/2017-03-future-space-colonization-terraforming-habitats.html.
[16] Reedy, "First Human Space Colony."

place.[17] The jurisdiction fell to the United States which, as per the Intergovernmental Agreement on Space Station Cooperation (IGA), holds that a crime involving citizens of a common nationality falls within the jurisdiction of said nation. Lucky for all involved, the IGA ensured that the procedural matters of this case were clear from the beginning.[18] Following the incident, however, many space legal experts felt as though they had dodged a bullet. This time jurisdiction was easy, but what about next time? Human endeavors in space will only increase in the future, and a myriad of questions about legal jurisdiction in space remain.[19]

The most significant problem raised from the McClain affair raises is where and when states have legal jurisdiction. Do states govern the behavior of their citizens or the behavior within their own territory? What happens under circumstances where international law prohibits states from claiming territory? What happens when nationals of different states interact? Is the IGA a suitable model to govern all of space rather than just the ISS? What are the ramifications of the lack of jurisdictional clarity in space matter? These are the questions this article aims to address.

Criminal Jurisdiction and Its Malcontents: What Law Governs Space?

The Outer Space Treaty. While the legal regime of outer space has notable and problematic deficits, this is not to say outer space is entirely devoid of a legal regime. It is not the "Wild West" as some hyperbolically claim.[20] The framework of modern space law was established with the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (known colloquially as the Outer Space Treaty, or

[17] Mike Baker, "NASA Astronaut Anne McClain Accused by Spouse of Crime in Space," *The New York Times*, August 23, 2019, https://www.nytimes.com/2019/08/23/us/astronaut-space-investigation.html.
[18] Mathilde Minet, "Is 2019 The Year When The First Crime In Space Was Committed?," Space Legal Issues, January 8, 2020, https://www.spacelegalissues.com/is-2019-the-year-when-the-first-crime-in-space-was-committed/.
[19] Minet, "First Crime In Space."
[20] Sarah Cruddas, "Space: Not the final frontier, but the new Wild West," *Politico*, January 19, 2020, https://www.politico.eu/article/space-final-frontier-wild-west/.

OST) in 1967.[21] A primary objective of the OST was to ensure that space would remain part of "the commons"–freely accessible to all states for scientific pursuits.[22] To this end, Article II of the OST prohibits individual states from claiming any portion or any region on a celestial body as the state's sovereign territory.[23] To the same end, Article IV prohibits the "establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies."[24]

Despite these restrictions, however, sovereignty is not prohibited in its entirety under the OST. Article VIII establishes that the state "on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such objects, and over any personnel thereof, while in outer space or on a celestial body."[25] In fact, the OST requires that states maintain the sovereignty of all objects it puts into space.[26] The OST makes no provision for abrogating sovereignty and states are required to retain sovereignty over objects indefinitely.[27] The Article VIII exception to the Article II prohibition on state claims to sovereignty in space allows states to exercise a degree of legal jurisdiction over the spacecraft they launch. The conditional allowance of sovereignty, as will be seen, contributes to the problem of ambiguous legal jurisdiction in space today.

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[21] "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies," opened for signature December 13, 1963, *United Nations Publication*, no. E.02.I.20, (1967), https://www.unoosa.org/pdf/ publications/STSPACE11E.pdf.
[22] Treaty, 3.
[23] Treaty, 4.
[24] Treaty, 4.
[25] Treaty, 5.
[26] Treaty, 4.
[27] Frans Von der Dunk, "Transfer of Ownership in Orbit: From Fiction to Problem" in *Ownership of Satellites: 4th Luxembourg Workshop on Space and Satellite Communication Law*, ed. Mahulena Hofmann and Andreas Loukakis (Baden-Baden, Baden-Württemberg, Germany: Nomos Publishing and Hart Publishing, 2017): 31-33. article=1102&context=spacelaw.

Another provision of importance in the OST is Article XII, which requires that "All stations, installations, equipment[,] and space vehicles on the [Moon] and other celestial bodies shall be open to representatives of other States Parties to the Treaty on a basis of reciprocity."[28] Through requiring "reasonable advance notice," "appropriate consultations," and "maximum precautions,"[29] the OST mandates that any structure established on a celestial body[30] must remain accessible to all other signatory states of the OST. This provision aims to ensure that by denying access, states do not exercise *de facto* control over any region of a celestial body.

The Intergovernmental Agreement. The Intergovernmental Agreement, or IGA (known officially as the Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station) is the treaty that governs space law specifically aboard the ISS.[31] Article 22 of the IGA addresses legal jurisdiction, with Section 1 establishing active personality[32] as the default jurisdiction in criminal matters, holding that all states with nationals aboard the ISS "may exercise criminal jurisdiction over personnel in or on any flight element who are their respective nationals."[33] The stipulation that this jurisdiction is exercised even "in or on any flight

[28] Treaty, 7.
[29] Treaty, 7.
[30] For purposes of this paper, "celestial bodies" will be understood to mean "planets and their natural satellites, asteroids, meteorites, and stars. There currently does not exist any internationally recognized legal definition of celestial bodies and the definition remains a matter of debate. For more information see Frans von der Dunk's *Defining Subject Matter under Space Law: Near Earth Objects versus Space Objects* and Virgiliu Pop's *A Celestial Body is a Celestial Body is a Celestial Body…*
[31] "Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station," conclusion date: January 29, 1998, *Treaties and Other International Acts Series*, no. 12927 (1998): 17, https://www.state.gov/wp-content/uploads/2019/02/12927-.
Multilateral-Space-Space-Station-1.29.1998.pdf.
[32] Active personality refers to the type or jurisdiction in international law in which a state may assert criminal jurisdiction over conduct of its nationals abroad.
[33] Agreement, 17.

element" means that even if a national of one state privy to the IGA is in a portion of the ISS registered to another state, then the state of the national in question retains criminal jurisdiction.[34] This rule exists despite the fact that the OST establishes a state's right to territorial jurisdiction over spacecraft it launches.[35] Recall that McClain, the astronaut aboard the ISS accused of illegally accessing her wife's bank account, was an American citizen.[36] This allowed criminal jurisdiction to fall to the United States, and the accusation passed without international incident.

There are, however, exceptions to the active personality principle in Section 2 of Article 22. In the event that the actions of an individual aboard the ISS "affects the life or safety of a national or another Partner State"[37] or that an alleged crime "occurs in or on or causes damage to the flight element of another Partner State,"[38] the affected state(s) may exercise a degree of jurisdiction. This jurisdiction is exercised through the requirement that the state of the alleged offending party consult on matters "concerning their [the affected states'] prosecutorial interests."[39] If, however, "within 90 days of the date of such consultation or within such other period as may be mutually agreed," a state with a claim to passive personality or territorial may exercise sole jurisdiction if the state with active personality jurisdiction "fails to provide assurances that it will submit the case to its competent authorities for the purpose of prosecution."[40] This means that, should a state with a claim to passive personality or territorial jurisdiction believe that an accused criminal will not prosecute the offending party, said state is free to exercise sole jurisdiction.

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[34] Agreement, 17.
[35] Treaty, 5: This is known as territorial jurisdiction, where the state in which a crime was alleged to have occurred exercises criminal jurisdiction.
[36] Baker, "Anne McClain."
[37] Agreement, 17: This is known as passive personality jurisdiction, where the state of the affected party, should it be a different state from the accused party, may exercise criminal jurisdiction.
[38] Agreement, 17.
[39] Agreement, 17.
[40] Agreement, 17.

Recall that the IGA governs only the affairs on the ISS and is not a major component of international space law. The reason for its inclusion in this article is because some have proposed, in order to remedy the legal ambiguities that currently exist, under that Article 22 be extended throughout outer space and effectively integrated into the OST.[41] This article will thus explain why this proposal does little to remedy existing issues and instead lends itself to further legal ambiguity.

Ambiguities of the OST

Crimes Outside of Spacecraft. The first ambiguity in the legal regime of outer space that emerges from the OST is on the matter of crimes that take place outside of spacecraft or other space constructions. The OST establishes that a state retains territorial jurisdiction only over of their launched "object[s]...and over any personnel thereof"[42] but is prohibited from claiming sovereignty over "the moon and other celestial bodies."[43] Territorial jurisdiction is thus limited only to spacecraft launched by and registered to a state. Because states cannot extend their sovereignty beyond such spacecraft, states are likewise unable to extend the territorial jurisdiction conferred to them under Article VIII of the OST. This leaves all areas of space outside of spacecraft ungoverned by existing legal regimes.[44] This would mean that if any crime is believed or alleged to have occurred on the surface of a celestial body or otherwise outside a spacecraft registered to a state on Earth, said crime would fall outside the jurisdiction of all existing legal regimes. Even if the incident involved nationals of the same state, said state would be unable to investigate or

[41] Taylor Stanton Hardenstein, "In Space, No One Can Hear You Contest Jurisdiction: Establishing Criminal Jurisdiction of the Outer Space Colonies Tomorrow," *Journal of Air Law and Commerce* 81, no. 2 (2016): 283-287, https://scholar.smu.edu/jalc/vol81/iss2/4.: It is beyond the scope of paper to summarize the argument presented by Hardenstein for this position. For further reading on the matter, see the cited article, Hardenstein's *In Space, No One Can Hear You Contest Jurisdiction.*

[42] Treaty, 5.

[43] Treaty, 4.

[44] Hardenstein, *"*In Space," 267; Reid White, "Plugging the Leaks in Outer Space Criminal Jurisdiction: Advocation for the Creation of a Universal Outer Space Criminal Statute," *Emory International Law Review* 35, no. 2 (2021): 349, https://scholarlycommons.law.emory.edu/cgi/viewcontent.cgi?article=1258&context=eilr.

prosecute, as this could constitute an extension of sovereignty over a celestial body or area of space outside of spacecraft, explicitly prohibited under Article VIII of the OST.[45]

Registration of Extraterrestrial Constructions. Until this point, we have discussed spacecraft as being "registered" to a state. This refers to Article I of the United Nations Convention on Registration of Objects Launched into Outer Space (known colloquially as the Registration Convention). This convention requires that if a state must register an object that it "launches or procures the launching of a space object" or "from whose territory or facility a space object is launched" with the United Nations.[46] When a space object is registered to a state, the state to which the object is registered (known as the "launching state") exercises sovereignty and jurisdiction over the object under Article VIII of the OST.[47] Under Article I the Registration Convention, the launching state is defined as the state "which launches or procures the launching of" the spacecraft and "from whose territory or facility" a spacecraft is launched.[48] This language presupposes two important stipulations: that all spacecraft depart from Earth and that all spacecraft are launched by a government. While this was the case in the past, it will not remain this way in the future. The language of the Registration Convention, and the way in which it interacts with the OST, has the potential to produce ambiguities in the regulations surrounding registration.

One way in which the wording of the Registration Convention produces jurisdictional ambiguity is that it does not clearly define what law governs outposts constructed on

[45] Treaty, 5.
[46] "Convention on Registration of Objects Launched into Outer Space," opened for signature on November 12, 1974, *United Nations Treaty* Series, no. 15020 (1976): 37, https://aerospace.org/sites/default/files/policy_archives/Registration%20Convention% 20Nov.
74.pdf.
[47] Treaty, 5.
[48] Convention, 37.

extraterrestrial planets using native materials. The United States,[49] Russia, China,[50] the European Union,[51] and Japan[52]–most of the major powers in space today–have all expressed interest in building a lunar base. Such an outpost is likely to be constructed using 3D printing technology that excavates the Lunar surface and molds the regolith into habitable modules.[53] The reason for this is transporting a ready-to-use habitation module from Earth to the Moon would be incredibly difficult due to how massive such a module would be. Additionally, given that the module would have been created on Earth, performing on-site maintenance would be difficult.[54] This will likely have applications beyond the Moon as well, such as in the construction of a Martian base.[55] An outpost constructed using extraterrestrial material will not be "launched" and would thus likely fall outside of the Registration Convention, which defines a launching state as one that launches or procures the launching of a spacecraft.[56] If states are unable to register such outposts under the Registration Convention, then said states could not claim them as their sovereign territory, as Article VIII concerns only objects registered under the Registration Convention. This means the behavior that occurred within these outposts, much like the surface from which they were constructed, would not be governed by any existing legal regime. This is particularly problematic

[49] Meghan Bartels, "NASA unveils plan for Artemis 'base camp' on the moon beyond 2024," *Space*, April 3, 2020, https://www.space.com/nasa-plans-artemis-moon-base-beyond-2024.html.
[50] Tereza Pultarova, "Russia, China reveal moon base roadmap but no plans for trips yet," *Space*, June 17, 2021, https://www.space.com/china-russia-international-lunar-research-station.
[51] Leonard David, "Lunar Leap: Europe Is Reaching for a Moon Base by the 2030s," *Space*, December 30, 2015, https://www.space.com/31488-european-moon-base-2030s.html.
[52] Mark Whittington, "Japan is joining the push to return to the moon," *The Hill*, July 25, 2021, https://thehill.com/opinion/technology/564718-japan-is-joining-the-push-to-return-to-the-moon.
[53] Giovanni Cesaretti, et. al., "Building components for an outpost on the Lunar soil by means of a novel 3D printing technology," *Acta Astronautica* 93 (August 2013): 431, https://www.sciencedirect.com/science/article/pii/S0094576513002889.
[54] Cesaretti, et. al., "Building components," 431.
[55] Cesaretti, et. al., "Building components," 449.
[56] Convention, 37.

given that using 3D printing to create outposts out of native material is humanity's best prospect for the construction of extraterrestrial outposts.[57]

Private Spacecraft and the Registration Convention. Another issue with Article VIII of the OST lies in the ambiguity of what constitutes a launching state with respect to private spacecraft. Put more simply, it is unclear whether private spacecraft are considered to be the sovereign property of–and thereby governed by–the state from which they are launched. Recall that a launching state is defined in the Registration Convention as the state which "launches or procures the launching" of a spacecraft or "from whose territory or facility" a spacecraft is launched.[58] The ambiguity lies in what the Registration Convention means by "procure" and "facility." A conservative interpretation of "procure" may hold that the state must be the agent that specifically seeks the launch of a spacecraft and that a privately owned facility is not, by extension of its location, a facility owned by the state (for purposes of Registration Convention).[59] Such an interpretation would mean that private spacecraft launched from Earth could not, under the Registration Convention, be registered to the state from which they were launched, meaning private spacecraft are excluded from Article VIII of the OST. As a result, private spacecraft would be left ungoverned by any legal regime, and any behavior on said spacecraft would fall outside any established jurisdiction.

This problem is compounded by the ambiguity of the Registration Convention with respect to the ability of states to claim Article VIII sovereignty over extraterrestrial outposts 3D printed from native materials. If states are unable to claim sovereignty over extraterrestrial launching

[57] Cesaretti, et. al., "Building Components", 449.
[58] Agreement, 17.
[59] Frans G. von der Dunk, "Space Tourism, Private Spaceflight and the Law: Key Aspects," *Space, Cyber, and Telecommunications Law Program Faculty Publications* 60 (2011): 150, https://digitalcommons.unl.edu/ spacelaw/ 60.
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facilities created with native material, then any spacecraft launched from such sites would effectively launch from territory/a facility that belongs to no state, meaning that no state could possibly fulfill the second criterion to be a "launching state" unde the Registration Convention.[60] Without a launching state, then no state under Article VIII could extend its sovereignty, exercise jurisdiction, and govern these spacecraft with its laws. This is of notable concern given that the Moon is likely to become a pitstop for spacecraft venturing out beyond the Earth-Moon system in coming years.[61]

Private Property and the Registration Convention. Espionage has been an integral characteristic of space competition since the Cold War[62] and remains a common practice of China's space strategy today.[63] Dr. Gregory Miller, a professor at the Air Command Staff College, has identified "corporate espionage, theft of intellectual property, and sabotage" undertaken by both competing companies and competing states as among the most pressing threats in space today.[64] Aside from states aiming to gain an advantage over their competitors, private actors (possibly under the sponsorship of another state or company) may also engage in such theft with the aim of selling the technology or information, possibly to their sponsor or other prospective buyers.[65] Competing states and companies may also use theft to "[sow] disorder on an adversary."[66] Any extraterrestrial outpost established or spacecraft launched into space is an

[60] Agreement, 17.
[61] David Whitehouse, *Space 2069: After Apollo: Back to the Moon, to Mars, and Beyond* (Berkeley, CA: Publishers Group West, 2020), 28.
[62] Alex Hollings, "How the CIA Hijacked a Soviet Spacecraft in 1959," *Sandboxx*, April 21, 2021, https://www.sandboxx.us/blog/the-cia-hijacked-a-soviet-spacecraft-in-1959/.
[63] Jerry Rogers, "Will China Steal Its Way to a Space Race Victory?," *The National Interest*, May 6, 2021, https://nationalinterest.org/blog/buzz/will-china-steal-its-way-space-race-victory-184574.
[64] Gregory D. Miller, "Space Pirates, Geosynchronous Guerillas, and Nonterrestrial Terrorists: Nonstate Threats in Space," *Air and Space Power Journal* (2019): 42, https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Volume-33_Issue-3/F-Miller.pdf.
[65] Miller, "Space Pirates," 43.
[66] Miller, "Space Pirates," 43.

attractive target for these types of attacks, as they are home to highly valuable space-related information and technology easily exploited by competing states for political advantage or competing companies for market advantage. However, as previously outlined, the language of the Registration Convention is not clear as to whether outposts constructed using extraterrestrial material or private spacecraft launched from both Earth or from the surface of a celestial body are covered under Article VIII of the OST. If not, this would mean that these outposts and private spacecraft could not be legally protected by any state as private property, lacking the sovereignty necessary to extend its laws over and prosecute offenders in these outposts and spacecraft. Without the ability to levy legal punishment, states' ability to deter theft and espionage is greatly diminished.

Compounding this threat is the fact that the OST is not clear on to what extent states may physically defend private property in space. Article XII requires that "All stations, installations, equipment and space vehicles" in space remain accessible to all other signatories of the OST.[67] The language of this article, in specifying "all" of such facilities would indicate that even private companies must abide by this requirement.[68] While the same article allows for states to request "reasonable advance notice" to take "maximum precautions" such that visits by other states do not "[interfere] with normal operations in the facility,"[69] it still negates the ability of states to deny access to their facilities to actors who may be there with the intention to steal technology or information. Even further, Article I states that "there shall be free access to all areas of celestial bodies."[70] Even if the operators of an extraterrestrial outpost were to have reasonable cause for denying a state or company entry to their facility, Article XII only allows states to hold

[67] Treaty, 7.
[68] Treaty, 7.
[69] Treaty, 7.
[70] Treaty, 4.

"appropriate consultations" in order to take "maximum precautions." There is no clear enunciation of when a state is permitted to deny a prospective entrant access to their facilities.[71] If the operators, after having let an actor into their facility, believe that information or equipment has been stolen, it unclear if they even have the power to do anything in the moment, as Article IV of the OST prohibits the "establishment of military bases, installations and fortifications" "the conduct of military manoeuvres on celestial bodies" and requires that all military personnel and equipment be used exclusively for "peaceful exploration."[72] This indicates that the presence of security forces may be illegal, further diminishing–if not eliminating entirely–the ability of facility operators to protect their property from theft or other attacks. Entitling states to take "maximum precaution" before the "representatives" of another state would imply that the drafters of the OST recognized the sensitivity of certain information and technology that may be kept in space, but these articles are highly unclear as to the extent to which outpost and spacecraft operators may defend this technology and information.

Ambiguities of the IGA

As discussed earlier, the IGA does not presently govern space law outside of the ISS. However, because extending Article 22 the IGA and effectively integrating it into the OST has been proposed,[73] this article will address the prospects of this proposal. For a review of Article 22, see "The Intergovernmental Agreement" under the subheading "What Law Governs Space?"

Competing Claims of Jurisdiction. The chief problem with extending Article 22 of the IGA to govern all of outer space, embedding it in the foundations of space law, is that it fails to effectively govern the interactions between nationals of different states. Under Article 22, the

[71] Treaty, 7.
[72] Treaty, 7.
[73] Hardenstein, "In Space," 283-287.

decision to claim jurisdiction lies with the state, meaning that any such claims would be issued in accordance with the interests and values of the state. If, however, such interests and values conflicted or were otherwise misaligned, states may find themselves locked in a gridlock without any clear resolution. The only guidance provided by Article 22 on the matter of such gridlock is a vague directive that states with competing claims "consult" with each other.[74] The foremost powers of space today can be approximately categorized into two groups: the West, consisting of the United States, the European Union, Japan, and Canada, and the Sino-Russian axis. This division is highly suitable to characterize the current international dynamic in space. The Western states have a long history of collaboration, of which is being continued in the Lunar Gateway Project.[75] Meanwhile, Russia and China, as part of a broader "strategic partnership," have increased their civil and military space cooperation.[76] The divide between these two groups runs deeper than space exploration. The two parties are similarly polarized on matters of criminal justice. Many Western countries currently have strained relationships with both China[77] and Russia[78] on criminal matters due to human rights abuses and a weak rule of law. In 2020, the United States suspended its extradition agreement with Hong Kong after the passage of a new security law in China which the United States alleged "destroyed the legal firewall between it's [Beijing's] legal system and that of Hong Kong."[79]

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[74] Agreement, 17.
[75] "Gateway," Gateway, NASA, last modified August 19, 2021, https://www.nasa.gov/gateway/overview.
[76] Jonathan T. Ward, *China's Vision of Victory* (New York: Atlas Publishing, 2019), 65.
[77] Noah E. Lipkowitz, "Why Countries Diverge over Extradition Treaties with China: The Executive Power to Extradite in Common and Civil Law Countries," *Virginia Journal of International Law* 59, no. 2 (2019): 462-463, https://static1.squarespace.com/static/5f0a3654a47d231c00ccd14f/t/5f3fd127dc65a031c8980104/1598017832145/lipkowitz-final-v3-1.pdf.
[78] Lipkowitz, "Why Countries Diverge," 497.
[79] Robbie Gramer, "U.S. Preparing to Suspend Extradition Treaty With Hong Kong," *Foreign Policy*, July 13, 2020, https://foreignpolicy.com/2020/07/13/china-hong-kong-escalation-trump-national-security-law-extradition-treaty/.

The strained relationship between the West and the Sino-Russian axis would likely complicate any attempt to expand Article 22 of the IGA to govern all of criminal law in space. For one, a productive consultation and resolution would be unlikely given the differences between Western governments and the Sino-Russian axis that has already complicated efforts to produce extradition treaties. Additionally, it has been historically seen that if a government is entitled to claim jurisdiction over some criminal behavior, it will do so if it believes it has a vested interest in investigating or prosecuting said behavior.[80] This can be seen in the death of Dr. Rodney Marks, an American contractor in Antarctica who died under mysterious circumstances while stationed at an American facility located on territory claimed by New Zealand. As per the Antarctic Treaty, the United States had a claim to active personality jurisdiction while New Zealand had a claim to territorial jurisdiction. Because the United States had a vested interest in the wellbeing of its contractors and New Zealand had a vested interest in the affairs of its territory, both asserted jurisdiction.[81] Given the explicit decision of many Western states to not sign extradition treaties with Russia or China, it is feasible–and likely–that a Western government would, where possible, assert jurisdiction if the Russian or Chinese government criminally charged one of its nationals. The Western state could assert that it has a vested interest in governing the affairs of and protecting its citizens–namely through protecting said citizens from possible unfair treatment at the hands of the Chinese or Russian government.

A similar issue may emerge between states with differing approaches to capital punishment. Many states have exceptions in their extradition agreements with the United States in which states are exempt them from their extradition obligations if there is reasonable belief that

[80] Hardenstein, "In Space," 272.
[81] Hardenstein, "In Space," 272.

capital punishment will be employed.[82] In the event that a state that has abolished the death penalty (abolitionist states), it may see it as their responsibility to, where possible, assert jurisdiction to prevent a citizen that that it played a role in criminally implicating from being sentenced to death in states where capital punishment remains in use (retentionist states). Such conflicts are most likely to occur between abolitionist states (Canada and the European Union) and retentionist states (Japan and the United States) within the West.[83] China is also the world's leading state executioner.[84] This, alongside fears among of the country's weak rule of law,[85] is likely to further incentivize Western states to assert jurisdiction to prevent their citizens from being criminally charged by the Chinese government. Thus, disputes over the death penalty may also produce contests over legal jurisdiction between governments. These disputes become even more complicated when one considers the possibility of more than two states claiming jurisdiction.

Ambiguity of Applicable Laws. Another deficiency of Article 22 is that it fails to clearly expound what laws apply where. Section 1 of Article 22 states that a state exercises criminal jurisdiction over its own citizens.[86] The first problem this raises is what happens if a national of one state is aboard a spacecraft registered to another state and engages in activity that is criminalized in the state of the spacecraft but not in the state of the national. In international law, the relevant principle is dual criminality, which requires that, for a citizen to be extradited, the crime they are alleged to have commited (and will thus be prosecuted for) in the foreign state must

[82] Jonathan Masters. "What Is Extradition?," Council on Foreign Relations, January 8, 2020, https://www.cfr.org/backgrounder/what-extradition.
[83] "Death penalty in 2019: Facts and figures," News, Amnesty International, last modified April 21, 2020, https://www.amnesty.org/en/latest/news/2020/04/death-penalty-in-2019-facts-and-figures/.
[84] Amnesty International, "Death penalty."
[85] Lipkowitz, "Why Countries Diverge," 63.
[86] Agreement, 17.

be criminalized in the citizen's state of origin.[87] While laws must not be exactly identical, substantial differences allow for a state to deny a requisition for extradition.[88] An important function of the dual criminality principle is in the case of the political offense exception–crimes in which "the state" is the primary victim, such as criticism of the government.[89] China, for example, reserves the right to prosecute anybody whose activity is "deemed politically sensitive by the government."[90] Russia, too, frequently persecutes its political dissidents.[91] Thus, if a Western citizen criticizes or disseminates information harmful to the Russian or Chinese government, the Western citizen has committed a political offense against a government, but their behavior is legal within their state of origin. In this scenario, the Western citizen could be accused of a crime that is not criminalized in their state of origin. This state of origin, under Article 22, would have the first opportunity to prosecute their citizen, but because their behavior was not criminal, the state would have nothing to prosecute the citizen for. The Russian or Chinese government would have passive personality jurisdiction in this instance, as the state itself would be the victim. Under Article 22, because the Western state with active personality jurisdiction (the citizen's state of origin) declined to prosecute, jurisdiction would fall to Russia or China.[92] It then becomes unclear what the course of action becomes. If the citizen is not prosecuted, then said citizen has broken the law without consequence. If the citizen is prosecuted, they will be prosecuted for conduct that is not illegal in their state of origin–the state that is responsible for governing them under Article 22

[87] Anna MacCormack, "The United States, China, and Extradition: Ready for the Next Step?," *Legislation and Public Policy* 12, no. 445 (2009): 453. https://www.nyujlpp.org/wp-content/uploads/2012/11/Anna-MacCormack- The-United-States-China-and-Extradition-Ready-for-the-Next-Step-.pdf.
[88] MacCormack, "Next Step," 453.
[89] MacCormack, "Next Step," 454.
[90] MacCormack, "Next Step," 475.
[91] Tatyana Beschastna, "Freedom of Expression in Russia as it Relates to Criticism of the Government," *Emory International Law* 27, no. 2 (2013): 1129-1130, https://scholarlycommons.law.emory.edu/cgi/viewcontent.cgi?article=1089&context=eilr.
[92] Agreement, 17.

of the IGA. Both scenarios are inherently unjust and the question ultimately becomes where one state's laws end and the other state's laws begin. This, too, would likely produce a contest of legal jurisdiction.

Failure to Resolve Existing Issues. Aside from the ambiguities it would produce itself, extending Article 22 to all of outer space would fail to resolve the ambiguities that exist within the current legal regime. There is nothing within Article 22–or the IGA–that clarifies what laws apply on the surface of celestial bodies, clarifies the Registration Convention, or clarifies the ability of states to defend private property in space. Furthermore, extending Article 22 would effectively mean that states are not able to govern the territory in space they do have sovereignty over–their spacecraft. Instead, jurisdiction would default to the state with active personality jurisdiction.

Problems Posed by the Ambiguities in the Criminal Jurisdiction of Outer Space

Failure to Achieve Justice. The question now becomes why this is important. First and foremost, the myriad of instances in which jurisdiction becomes contested and ambiguous threatens the ability of states to achieve justice. We can return again to the example of the death of Dr. Marks. Article VIII of the Antarctic Treaty closely resembles Article 22 of the IGA. It both establishes active personality jurisdiction as the default jurisdiction in Antarctica and requires that in the event that another state is "concerned...with regard to the exercise of jurisdiction" the two states must "consult together with a view to reaching a mutually acceptable solution."[93] Like Article 22, the Antarctic Treaty provides no framework as to how states with competing claims to jurisdiction should "consult." Because the United States and New Zealand had no direction in how they should consult, the case of Dr. Marks' death remains, to this day, unresolved.[94]Antarctic

[93] Hardenstein, "In Space," 272.
[94] Hardenstein, "In Space," 272; White, "Plugging the Leaks," 362.

experts have voiced concerns that, without reforming Antarctica's jurisdictional system, other cases may also end in a legal stalemate.[95] The case of Dr. Marks demonstrates that a vague directive to "consult" is insufficient for dealing with competing claims to jurisdiction, and that a more comprehensive framework is necessary to ensure cases can be adequately pursued. It is worth noting that the United States and New Zealand are also close partners, both liberal democratic countries, share great cultural similarities, and have a history of political engagement and international cooperation.[96] If two states on remarkably friendly terms are unable to cooperate effectively, it is highly unlikely that states on far more hostile terms–states of the West and the Sino-Russian axis–would be able to.

It is likely that a contest of jurisdiction between the West and the Sino-Russian axis would escalate beyond a stalemate like in the case of Dr. Marks. Space is central to China's foreign policy. Anthony Cordesman of the Center for Strategic and International Studies explains that "China's growing space capabilities translate into military capabilities that affect all aspects of conventional and nuclear targeting, ground-air-sea operations, precision conventional strike capacities, and missile defense."[97] For this reason, the Chinese military regards space as the "ultimate high ground."[98] Dr. Jonathan Ward, a national security consultant and academic of Chinese-American relations has identified dominance of space as a major foreign policy goal of Chinese Communist Party General Secretary Xi Jinping.[99] Given the importance of space to both China and the United States, it is possible that a contest of legal jurisdiction could become part of a broader conflict with both states attempting to assert their dominance within the domain. Such a

[95] Hardenstein, "In Space," 273.
[96] U.S. Library of Congress, Congressional Research Service, *New Zealand: Background and Relations with the United States*, R44552 (2021), https://fas.org/sgp/crs/row/R44552.pdf.
[97] Ward, *China's Vision*, 64.
[98] *New Zealand*, 64.
[99] *New Zealand*, 62.

conflict has the potential to erupt into violent, direct confrontation according to the US-China Economic and Security Review Commission.[100]

Gray Zone Tactics. The next danger of these ambiguities is that they may be exploited by competing powers, through use of gray zone tactics, in space. Gray zone tactics are means through which states act coercively toward other states while remaining below the threshold which would inspire a military response.[101] The "gray zone" the term references is the "zone" that exists between peace and military conflict.[102]At the heart of gray zone tactics is the ability of parties acting aggressively to "[cloak themselves] in deniability" which they do through "[taking] advantage of...ambiguity to achieve gradual gains."[103] Through exploiting ambiguities, states are able to "unambiguous or attributable violations of international law or norms," thereby preventing the outbreak of conflict.[104] The states that make more frequent use of these tactics are Russia, China, Iran, and North Korea.[105] Through these tactics, states are able to coerce other states into acceding to the former's interests.[106] China, for example, in an attempt to achieve control over the South China Sea, has constructed artificial islands and, where it has established uncontested control, built military infrastructure to expand and consolidate its control over the body's maritime trade routes.[107] Russia, in order to undermine NATO, has engaged in disinformation campaigns in order to manipulate elections and attempted to peel away prospective members of the trans-Atlantic

[100] *New Zealand*, 64.
[101] Lyle J. Morris, et. al., "Gaining Competitive Advantage in the Gray Zone: Response Options for Coercive Aggression Below the Threshold of Major War," RAND Corporation (2019): 1-2. https://www.rand.org/content/dam/rand/pubs/research_reports/RR2900/RR2942/RAND_RR2942.pdf.
[102] Morris, et. al., "Gaining Competitive Advantage," 2.
[103] Morris, et. al., "Gaining Competitive Advantage," 12.
[104] Morris, et. al., "Gaining Competitive Advantage," 9.
[105] Morris, et. al., "Gaining Competitive Advantage," 6-12.
[106] Morris, et. al., "Gaining Competitive Advantage," 13.
[107] Adrien Chorn and Monica Michiko, "Maritime Gray Zone Tactics: The Argument for Reviewing the 1951 U.S.-Philippines Mutual Defense Treaty," Center for Strategic and International Studies, October 1, 2019, https://www.csis.org/maritime-gray-zone-tactics-argument-reviewing-1951-us-philippines-mutual-defense-treaty.

alliance.[108] Russia has even begun to employ these tactics in space, having tested what is believed to be space-based satellite-destroying technology.[109]

Ambiguity is at the hard of gray zone tactics, and the ambiguities in the existing space law regime lend themselves to such exploitation. One way in which states may do this is through a unique form of hostage diplomacy. The jurisdictional ambiguity in space would allow a state to bring exaggerated (or fabricated) charges against the nationals of another state in order to trap them in a legal limbo in order to extract concessions from the national's home state–something both Russia and China have done in the past.[110] States could do this to extract specific concessions, or to disincentivize states from pursuing manned space missions. States could also take advantage of the ambiguity surrounding property rights in space and stalk the satellites of other states, something Russia was caught doing last year.[111] In exploiting the same ambiguity, states could damage outposts or statecraft that states do not, under Article VIII of the OST, exercise legal jurisdiction over. States may do this through funding proxy groups (such as space pirates or astro-terrorists),[112] a common gray zone tactic.[113] States would also free to steal information and technology from these outposts and spacecraft due to the lack of private property protections, similar to gray zone tactics frequently employed on Earth.[114] States frequently justify the use of gray zone tactics with references to international law,[115] and Article I of the OST may prove to be

[108] Kathleen Hicks, "Russia in the Gray Zone," Aspen Institute, July 18, 2019, https://www.aspeninstitute.org/blog-posts/russia-in-the-gray-zone/.
[109] Loren Grush, "Russia just tested satellite-destroying tech in space, US Space Command claims," *The Verge*, July 23, 2020, https://www.theverge.com/2020/7/23/21335506/russia-anti-satellite-weapon-test-kosmos-2543.
[110] Steve LeVine, "The new age of hostage diplomacy," *Axios*, January 12, 2019, https://www.axios.com/international-arrests-poland-china-hostage-diplomacy-e1f249f0-6a45-430d-88e2-aed7ce4ecfc3.html.
[111] W. J. Hennigan, "Exclusive: Strange Russian Spacecraft Shadowing U.S. Spy Satellite, General Says," *TIME*, February 10, 2020, https://time.com/5779315/russian-spacecraft-spy-satellite-space-force/.
[112] Miller, "Space Pirates," 43.
[113] Morris, et. al., "Gaining Competitive Advantage," 9.
[114] Morris, et. al., "Gaining Competitive Advantage," 48.
[115] Morris, et. al., "Gaining Competitive Advantage," 9-10.

particularly useful in justifying this theft, as it states that the "exploration and use of outer space...shall be the province of all mankind."[116] These gray zone tactics would turn space into an openly hostile domain, threatening humanity's access to the cosmos and the material benefits and scientific knowledge it has for us.

Weak Property Rights. Finally, the ambiguous nature of private property protections will likely have a negative impact on private investment in space. Normative economic logic posits that production is disincentivized when companies fear their products are at risk of expropriation.[117] As Dr. Mancur Olson explained, "In a world of roving banditry there is little or no incentive to produce or accumulate anything that may be stolen."[118] Private property rights exist to protect companies from such expropriation and thus dull these fears.[119] In extending this to space, if private spaceflight and space exploration companies fear their technology and information is insecure and at risk of expropriation in space (of which is reasonable fear to have[120]), they are unlikely to invest in space. This would be a highly unfortunate outcome due to the vast potential private spacefaring companies hold for humanity. The motives of private space exploration are fundamentally different from state agencies. Rather than pursuing state goals, companies such SpaceX, Virgin Galactic, and Blue Origin "supply the demand they create."[121] What this means is that certain goods are produced best in space, and commercial space companies exist for the

[116] Treaty, 4.
[117] Timothy Besley and Maitreesh Ghatak, "Property Rights and Economic Development," in *Handbook of Development Economics*, ed. Dani Rodrik and Mark Rosenzweig (Amsterdam: Elsevier B. V., 2010), 4565, https://reader.elsevier.com/reader/sd/pii/B9780444529442000069?token=5EF6C988AA17D57BA2C6B870029E70D0CEC7891AAD947219425B9551F43711EB32F615B11EB7215AD02755A9B2F537B3&originRegion=us-east-1&originCreation=20210823232331.
[118] Mancur Olson, "Dictatorship, Democracy, and Development," *The American Political Science Review* 87, no. 3 (September 1993): 568, https://www.jstor.org/stable/2938736.
[119] Besley and Ghatak, "Property Rights," 4588.
[120] Miller, "Space Pirates," 43.
[121] Matt Weinzierel and Mehak Sarang, "The Commercial Space Age Is Here," *Harvard Business Review*, February 12, 2021, https://hbr.org/2021/02/the-commercial-space-age-is-here.

production and provision. These goods include high-quality fiber-optic cables,[122] vaccines,[123] and 3D-printed human tissue.[124] If companies feel they will not reap the benefits of this innovation, they will decline to invest, and humanity will lose out on enjoying the societal benefits of commercial spaceflight and exploration.

Conclusion

Space poses a number of exciting possibilities to humanity, but with that comes a number of challenges. As it stands, the legal regime in space remains highly incomplete. Space law lacks a clear enunciation of when states have legal jurisdiction and when they do not. Without these regulations, ambiguities are produced within outer space's legal regime, making it unclear when and where a state may exercise jurisdiction. These endanger the ability of states to achieve justice for nationals victimized by criminal behavior, allow competing states to engage in gray zone conflicts, and threaten the development of a private space industry. A proposed solution to this has been extending Article 22 of the IGA throughout all of outer space. This proposal, however, fails to remedy the problems that exist presently, and implementing it would come with great logistical difficulties. It is crucial that we address the deficits in the legal regime of space so that we may enjoy the great potential the final frontier has for humanity.

[122] Weinzierel and Sarang, "Commercial Space Age."
[123] Denis Chose, "Commercial Space Travel May Bring Science Benefits, Advocates Say," *Space*, june 20, 2012, https://www.space.com/16228-nasa-commercial-human-spaceflight-benefits.html.
[124] Elizabeth Howell, "A BFF in Space! Bioprinter Will 3D-Print Human Tissue on the Space Station," *Space*, July 1, 2019, https://www.space.com/3d-printing-human-tissue-in-space.html.

Bibliography

"Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station." Concluded January 29, 1998. *Treaties and Other International Acts Series*, no. 12927. https://www.state.gov/wp-content/uploads/2019/02/12927-.

Amnesty International. "Death penalty in 2019: Facts and figures." News. Last modified April 21, 2020. https://www.amnesty.org/en/latest/news/2020/04/death-penalty-in-2019-facts-and-figures/.

Bachman, Justin. "New Space Race Shoots for Moon and Mars on a Budget." *Bloomberg*, November 28, 2020. https://www.bloomberg.com/news/articles/2020-11-28/new-space-race-shoots-for-moon-and-mars-on-a-budget-quicktake.

Baker, Mike. "NASA Astronaut Anne McClain Accused by Spouse of Crime in Space." *The New York Times*, August 23, 2019. https://www.nytimes.com/2019/08/23/us/astronaut-space-investigation.html.

Bartels, Meghan. "NASA unveils plan for Artemis 'base camp' on the moon beyond 2024." *Space*, April 3, 2020. https://www.space.com/nasa-plans-artemis-moon-base-beyond-2024.html.

Beschastna, Tatyana. "Freedom of Expressionin Russia as it Relates to Criticism of the Government." *Emory International Law* 27, no. 2 (2013): 1105-1144. https://scholarlycommons.law.emory.edu/cgi/viewcontent.cgi?article=1089&context=eilr.

Besley, Timothy and Maitreesh Ghatak. "Property Rights and Economic Development." In *Handbook of Development Economics*, edited by Dani Rodrik and Mark Rosenzweig, 4525-4595. Amsterdam: Elsevier B. V., 2010. https://doi.org/10.1016/B978-0-444-52944-2.00006-9.

Cesaretti, Giovanni, Enrico Dini, Xavier De Kestelier, Valentina Colla, and Laurent Pambaguian. "Building components for an outpost on the Lunar soil by means of a novel 3D printing technology." *Acta Astronautic* 93 (January 2014): 430-450. https://doi.org/10.1016/j.actaastro.2013.07.034.

Chorn, Adrien and Monica Michiko. "Maritime Gray Zone Tactics: The Argument for Reviewing the 1951 U.S.-Philippines Mutual Defense Treaty." Center for Strategic and International Studies. October 1, 2019. https://www.csis.org/maritime-gray-zone-tactics-argument-reviewing-1951-us-philippines-mutual-defense-treaty.

Chose, Denis. "Commercial Space travel May Bring Science Benefits, Advocates Say." *Space*, July 1, 2019. https://www.space.com/16228-nasa-commercial-human-spaceflight-

benefits.html.

"Convention on Registration of Objects Launched into Outer Space." Opened for signature on November 12, 1975. *United Nations Treaty Series*, no. 15020. https://aerospace.org/sites/default/files/policy_archives/Registration%20Convention% 20Nov74.pdf.

Cruddas, Sarah. "Space: Not the final frontier, but the new Wild West." *Politico*, January 19, 2020. https://www.politico.eu/article/space-final-frontier-wild-west/.

David, Leonard. "Lunar Leap: Europe Is Reaching for a Moon Base by the 2030s." *Space*, December 30, 2015. https://www.space.com/31488-european-moon-base-2030s.html.

Davis, Monte. "Gerard K. O'Neill on Space Colonies." *OMNI*, October 12, 2017. https://omnimagazine.com/ interview-gerard-k-oneill-space-colonies/.

Gramer, Robbie. "U.S. Preparing to Suspend Extradition Treaty With Hong Kong." *Foreign Policy*, July 13, 2020. https://foreignpolicy.com/2020/07/13/china-hong-kong-escalation-trump-national-security-law-extradition-treaty/.

Grush, Loren. "Russia just tested satellite-destroying tech in space, US Space Command claims." *The Verge*, July 23, 2020. https://www.theverge.com/2020/7/23/21335506/russia-anti-satellite-weapon-test-kosmos-2543.

Hardenstein, Taylor Stanton. "In Space, No One Can Hear You Contest Jurisdiction: Establishing Criminal Jurisdiction of the Outer Space Colonies Tomorrow." *Journal of Air Law and Commerce* 81, no. 2 (2016): 251-288. https://scholar.smu.edu/jalc/vol81/iss2/4.

Hennigan, W. J. "Exclusive: Strange Russian Spacecraft Shadowing U.S. Spy Satellite, General Says." *TIME*, February 10, 2020. https://time.com/5779315/russian-spacecraft-spy-satellite-space-force/.

Hicks, Kathleen. "Russia in the Gray Zone." Aspen Institute. July 18, 2019. https://www.aspeninstitute.org/blog-posts/russia-in-the-gray-zone/.

Hollings, Alex. "How the CIA Hijacked a Soviet Spacecraft in 1959." *Sandboxx*, April 21, 2021. https://www.sandboxx.us/blog/the-cia-hijacked-a-soviet-spacecraft-in-1959/.

Howell, Elizabeth. "A BFF in Space! Bioprinter Will 3D-Print Human Tissue on the Space Station." *Space*, July 1, 2019. https://www.space.com/3d-printing-human-tissue-in-space.html.

Jones, Andrew. "China's Chang'e 4 lander and rover complete 15th lunar day on moon's far side." *Space*, March 4, 2020. https://www.space.com/china-change-4-mission-completes-15th-lunar-day.html.

LeVine, Steve. "The new age of hostage diplomacy." *Axios*, January 12, 2019. https://www.axios.com/international-arrests-poland-china-hostage-diplomacy-e1f249f0-6a45-430d-88e2-aed7ce4ecfc3.html.

Lipkowitz, Noah E. "Why Countries Diverge over Extradition with Chin: The Executive Power to Extradite in Common and Civil Law Countries." *Virginia Journal of International Law* 59, no. 2 (2019): 440-501. https://static1.squarespace.com/static/5f0a3654a47d231c00ccd14f/t/5f3fd127dc65a031c8980104/1598017832145/lipkowitz-final-v3-1.pdf.

MacCormack, Anna. "The United States, China, and Extradition: Ready for the Next Step?" *Legislation and Public Policy 12*, no. 445 (2009): 445-497. https://www.nyujlpp.org/wp-content/uploads/2012/11/Anna-MacCormack-The-United-States-China-and-Extradition-Ready-for-the-Next-Step-.pdf.

Masters, Jonathan. "What Is Extradition?" Council on Foreign Relations. January 8, 2020. https://www.cfr.org/backgrounder/what-extradition.

McMillan, Anne. "The final frontier – 21st century space race." July 14, 2021. International Bar Association. https://www.ibanet.org/the-final-frontier.

Miller, Gregory D. "Space Pirates, Geosynchronous Guerillas, and Nonterrestrial Terrorists: Nonstate Threats in Space." *Air and Space Power Journal* (2019): 33-51. https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Volume-33_Issue-3/F-Miller.pdf.

Minet, Mathilde. "Is 2019 The Year When The First Crime In Space Was Committed?" Space Legal Issues. January 8, 2020. https://www.spacelegalissues.com/is-2019-the-year-when-the-first-crime-in-space-was-committed/.

Morris, Lyle J., Michael J. Mazarr, Jeffrey W. Hornung, Stephanie Pezard, Anika Binnendijk, and Marta Kepe. "Gaining Competitive Advantage in the Gray Zone: Response Options for Coercive Aggression Below the Threshold of Major War." RAND Corporation, 2019. https://www.rand.org/content/dam/rand/pubs/research_reports/RR2900/RR2942/RAND_RR2942.pdf.

National Aeronautics and Space Association. "Gateway." Last modified August 19, 2021. https://www.nasa.gov/gateway/overview.

Olson, Mancur. "Dictatorship, Democracy, and Development." *The American Political Science Review* 87, no. 3 (September 1993): 567-576. https://www.jstor.org/stable/2938736.

Powell, Corey S. "Jeff Bezos foresees a trillion people living in millions of space colonies. Here's what he's doing to get the ball rolling." NBC News, May 15, 2019. https://www.nbcnews.com/mach/science/jeff-bezos-foresees-trillion-people-living-millions-space-colonies-here-ncna1006036#anchor-GerardONeillsfrontiervision.

Pultarova, Tereza. "Russia, China reveal moon base roadmap but no plans for trips yet." *Space*,

June 17, 2021. https://www.space.com/china-russia-international-lunar-research-station.

Reedy, Christianna. "When Will the First Human Space Colony Be Established?" *Futurism*, August 17, 2017. https://futurism.com/when-will-the-first-human-space-colony-be-established.

Rogers, Jerry. "Will China Steal Its Way to a space Race Victory?" *The National Interest*, May 6, 2021. https://nationalinterest.org/blog/buzz/will-china-steal-its-way-space-race-victory-184574.

Street, Francesca. "First space tourist Dennis Tito: 'It was the greatest moment of my life'." CNN Travel, July 20, 2021. https://ww.cnn.com/travel/article/space-tourism-20-year anniversary-scn/index.html.

"Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies." Opened for signature December 13, 1963. *United Nations Publications* no. E.02.I.20. https://www.unoosa.org/pdf/ publications/STSPACE11E.pdf.

U.S. Library of Congress. Congressional Research Service. *New Zealand: Background and Relations with the United States*, by Bruce Vaughn. R44552. 2021. https://fas.org/sgp/ crs/row/R44552.pdf.

Vance, Ashlee. "The Future of Space Is Bigger Than Jeff Bezos, Richard Branson, or Elon Musk." *Bloomberg*, July 16, 2021. https://www.bloomberg.com/news/articles/2021-07-16/billionaire-space-race-between-bezos-branson-and-musk-is-just-the-beginning.

Von der Dunk, Frans. "Space Tourism, Private Spaceflight and the Law: Key Aspects." *Space, Cyber, and Telecommunications Law Program Faculty Publications* 60 (2011): 146-152. https://digitalcommons.unl.edu/spacelaw/60.

Von der Dunk, Frans. "Transfer of Ownership in Orbit: From Fiction to Problem." In *Ownership of Satellites: 4th Luxembourg Workshop on Space and Satellite Communication Law*, ed. Mahulena Hofmann and Andreas Loukakis. Baden-Baden, Baden-Württemberg, Germany: Nomos Publishing and Hart Publishing, 2017.

Wall, Mike. "SpaceX's very big year: A 2020 filled with astronaut launches, Starship tests and More." *Space*, December 28, 2020. https://www.space.com/spacex-astronaut-starship-launches-2020-milestones.

Wall, Mike. "US Is in a New Space Race with China and Russia, VP Pence Says." *Space*, March 27, 2019. https://www.space.com/new-space-race-moon-mike-pence-says.html.

Ward, Jonathan T. *China's Vision of Victory*. New York: Atlas Publishing, 2019.

Weinzierel, Matt and Mehak Sarang. "The Commercial Space Age Is Here." *Harvard Business*

Review, February 12, 2021. https://hbr.org/2021/02/the-commercial-space-age-is-here.

White, Reid. "Plugging the Leaks in Outer Space Criminal Jurisdiction: Advocation for the Creation of a Universal Outer Space Criminal Statue." *Emory International Law Review* 35, no. 2 (2021): 333-376. https://scholarlycommons.law.emory.edu/eilr/vol35/iss2/5.

Whitehouse, David. *Space 2069: After Apollo: Back to the Moon, to Mars, and Beyond*. Berkeley, CA: Publishers Group West, 2020.

Whittington, Mark. "Japan is joining the push to return to push to return to the moon." *The Hill*, July 25, 2021. https://thehill.com/opinion/technology/564718-japan-is-joining-the-push-to-return-to-the-moon.

Williams, Matt. "The future of space colonization–terraforming or space habitats?" *Phys*, March 10, 2017. https://phys.org/news/2017-03-future-space-colonization-terraforming-habitats.html.