Property Rights in Outer Space:
The Case of Private Ownership of Celestial Bodies

by

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A thesis submitted to McGill University
in partial fulfillment of the requirements of
the degree of **MASTER OF LAWS (LL.M.)**

Institute of Air and Space Law
McGill University
Montréal, Québec
August 2015

For my beloved wise grandfather,

May bright stars keep him company…

Acknowledgements

I want to express my heartfelt appreciation and gratitude for the help and support of the following persons who, in one way or another, have contributed to my studies in space law and to the completion of this thesis.

First and foremost, I thank Cynda and Marcel Arsenault for their financial support through the *Erin J. Arsenault Fellowship* that offered me the opportunity to focus on and commit to my studies.

I thank Professor Dr. Georgios Kyriakopoulos, the supervisor of my previous LL.M.'s thesis, for lighting my way to space law and supporting every relevant step of mine: Thank you for all your encouragement, advice and ideas and primarily for introducing me to the charming field of space law!

I also want to thank Dr. Cassandra Steer and Dr. Jinyuan Su for all the discussions we had on my topic and for their kind words that constantly encouraged me. Also, this thesis would not have been possible without the valuable friendship and support of my colleagues and friends Sandy Belle Habchi and Lukas Vanhonnaeker for being next to me throughout the whole drafting procedure by motivating me and by being my friends: Thank you for all your help and understanding!

I want to thank all my family and especially my parents, Kiki and Babis, my sister, Fay, and my dearest friend Nikos for supporting every decision of mine all these years and for invaluably contributing to my studies and to the accomplishment of my endeavors by giving of themselves: My endless love and appreciation for them, for teaching me how to fight for my goals with patience and persistence could not be described in words!

I also want to sincerely thank all the people of the Institute of Air and Space Law for warmly welcoming me to their "family", for providing me with courage and for making me feel like home by creating an environment ideal for my research and study. Special thanks to Maria Damico and Professor Paul Dempsey for all their advice and their kind interest and support.

Above all, I want to thank Professor Ram Jakhu for being my supervisor, for advising me in all my academic concerns, for giving me opportunities to deepen in space law, and for always finding the time to provide me with feedback and valuable comments on my thesis. I feel honored and grateful for being his student and thankful that he is my supervisor, teacher and in any way a mentor. This thesis would not have been possible without his support, encouragement and insights at every stage of the drafting procedure: Thank you so much!

"When you set out for distant Ithaca
fervently wish your journey may be long
full of adventures and with much to learn".*****

I thank you all with all my heart for making such a journey in space law possible, worthwhile and the best of my life so far…

16 August 2015
Boulder, Colorado.

* C. P. Cavafy (translated from the Greek by J.C. Cavafy), *Poems* (Greece; Ikaros: 2003).

Abstract

Commercial exploitation of outer space has intensely been discussed by the international community and the space industry. Such exploitation of outer space often presupposes the acquisition of property rights on parts of outer space; on minerals of celestial bodies (*i.e.*, the case of space mining), an activity that currently constitutes one of the biggest commercial initiatives of the space industry. Despite academic and legal efforts to illuminate the issue of property rights in outer space, there is no interpretation of the relevant space law provisions to provide global uniformity and unity. The very nature of outer space – an area beyond sovereignty and appropriation as enshrined in the provisions of space law – constitutes the main barrier to ownership acquisition on parts of outer space. Recent investment plans and objectives of space actors that point to extract and exploit parts of celestial bodies, coupled with the terrestrial needs to access alternative natural resources, render the discussion of the issue essential.

Similarly, the vast amount of harvestable outer space mineral resources that are proven to exist in celestial bodies constitute another reason to support an interpretation of *lex spetialis* in a manner that will facilitate their commercial use and exploitation by allowing the establishment of ownership on them. This thesis argues the legality of private ownership of parts of celestial bodies in view of the general status of outer space. The examination of such issue revolves around three main axes that form the basis of the three chapters of this thesis: the justification of the need to examine the issue and its significance for both the international legal community and the space industry; the specific characteristics of the nature of outer space, and; the subsequent interpretation of the provisions of space law (*i.e.* mainly the principles of "non-appropriation" and "freedom of exploration and use" of outer space), cores in the *corpus juris spatialis*.

Hence, this thesis aims to cover the silence of *lex spatialis* on the matter; silence which creates a significant *lacuna* in space law and cumbers space industry initiatives by creating uncertainty.

Résumé

L'exploitation commerciale de l'espace a été fortement discutée par la communauté internationale et l'industrie spatiale. Une telle exploitation de l'espace présuppose l'acquisition de droits de propriété sur des parties de l'espace: sur des minéraux de corps célestes (*i.e.,* le cas de l'exploitation minière de l'espace), une activité qui est actuellement une des plus grandes initiatives commerciales de l'industrie spatiale. Malgré les efforts tant académiques que légaux de résoudre le problème des droits de propriété dans l'espace, la compréhension du droit de l'espace n'est pas uniforme. La nature de l'espace – une zone au-delà de toute souveraineté et acquisition tel que le droit de l'espace le prévoit – est la barrière principale à l'acquisition de droits de propriété sur des parties de l'espace. Des plans d'investissement récents ainsi que les objectifs d'acteurs dans le secteur de l'espace se dirigent vers l'extraction et l'exploitation de parties de corps célestes, couplés aux besoins terrestres d'avoir accès à des ressources naturelles alternatives, rendent critiquent le besoin d'en discuter.

De façon similaire, la majeure partie des ressources minérales pouvant être récoltées dans l'espace au sein de corps célestes constituent une autre raison d'argumenter pour une interprétation de la *lex* spacialis en faveur de l'utilisation et de l'exploitation de telles parties de corps célestes ce qui permettrait d'y attacher des droits de propriété.

Cette thèse argumente en faveur de la légalité de droits de propriété privés sur des parties du corps célestes au regard du statut général de l'espace. L'analyse de cette question tourne autour de trois axes qui forment la base des trois chapitres de cette thèse: la justification du besoin d'analyser cette question et son importance tant pour la communauté légale internationale que pour l'industrie spatiale; les caractéristiques de la nature de l'espace, et; l'interprétation du droit de l'espace (*i.e.,* en particulier les principes de "non-appropriation" et de "liberté d'utilisation et d'exploration de l'espace"), les noyaux du corpus juris spatialis.

En conséquence, cette thèse à pour objet de couvrir le silence de la lex spetialis à ce sujet; silence qui crée une lacune importante dans le régime du droit de l'espace et qui ralenti les initiatives de l'industrie spatiale en créant de l'incertitude.

Acronyms and Abbreviations

Apollo Lunar Landing Legacy Act	Act to establish the Apollo Lunar Landing Sites National Historical Park on the Moon, and for other purposes, 113th Congress, House of Representatives (8 July 2013).
Antarctic Treaty	Antarctic Treaty, signed in Washington D.C. (1 December 1959).
Asteroids Act	American Space Technology for Exploring Resource Opportunities In Deep Space Act, 13th Congress, House of Representatives (10 July 2014).
Bogota Declaration	Declaration of the first meeting of equatorial countries (3 December 1976).
Chicago Convention	Convention on International Civil Aviation, signed in Chicago (7 December 1944).
COPUOS	Committee on the Peaceful Uses of Outer Space
CSA	Canadian Space Agency
EAA	European Environmental Agency
ECHR	European Convention on Human Rights, signed in Rome (4 November 1950).
ESA	European Space Agency
ESA Convention	Convention of Establishment of a European Space Agency (30 May 1975).
GA	General Assembly
Geneva Convention	1958 Geneva Conventions on the Law of the Sea, signed in Geneva (29 April 1958).
IAA	International Academy of Astronautics
IAF	International Astronautical Federation
ICJ	International Court of Justice
ICTY	International Criminal Tribunal for the Former Yugoslavia
IEET	Institute for Ethics and Emerging Technology
IISL	International Institute of Space Law

ILA	International Law Administration
KESE	Kepler Development and Space Engineering LLC.
Liability Convention	Convention on International Liability for Damage Caused by Space Objects (29 March 1972).
MIT	Massachusetts Institute of Technology
Moon Agreement	Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (18 December 1979).
NASA	National Aeronautics and Space Administration of the United States
Outer Space Treaty	Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (27 January 1967).
PCIJ	Permanent Court of International Justice
Registration Convention	Convention on Registration of Objects Launched into Outer Space (6 June 1975).
Rescue and Return Agreement	Agreement the Rescue of Astronauts, the Return of Astronauts and Return of Objects Launched into Outer Space (22 April 1968).
Space Resource Exploration and Utilization Act of 2015	A Bill to promote the development of a United States commercial space resource exploration and utilization industry and to increase the exploration and utilization of resources in outer space, 114th Congress, House of Representatives (15 June 2015).
UDHR	Universal Declaration of Human Rights, signed in Paris (16 December 1949).
UN	United Nations
UN Charter	Charter of the UN
UNCLOS	UN Convention on the Law of the Sea, signed in Jamaica (10 December 1982).
UNCOSA	United Nations Coordination of Outer Space Activities
UNGAOR	UN General Assembly Resolution
UNODA	United Nations Office for Disarmament Affairs

UNOOSA	UN Office for Outer Space Affairs
USA	United States of America
USSR	Union of Soviet Socialist Republics
VCLT	Vienna Convention on the Law of Treaties, signed in Vienna (23 May 1969).

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Chapter III: Private Ownership of Celestial Bodies
From Science Fiction to Reality

Chapter I: Defining the Problem
The Riddle of the Sphinx

Science fiction is something that could happen - but usually you wouldn't want it to. Fantasy is something that couldn't happen - though often you only wish that it could.[1]

I. Introduction

Science fiction has always been visualizing human presence in outer space and mining it.[2] Robert Heinlein's imaginary "Stone family"[3] travels to an asteroid named "Belt" in order to trade with miners that exploit the celestial body. In fact, this picture is not a far cry from reality; major space affiliated companies have already started engaging in future commercial space exploitation activities that require the extraction of minerals from celestial bodies. [4] Such activities debouch as

[1] Arthur Clarke, *The Collected Stories of Arthur Clarke, Volume I: History Lesson* (New York: Rosetta Books LLC, 2000), at foreword.

[2] Isabella Henrietta Philepina Diederiks-Verschoor, *An Introduction to Space Law* (The Netherlands: Kluwer Law International, 1999), at 1; some of the respective literature pieces include the *Heavy Time* novel by C. Cherryh, where Bird and Ben, the two heroes of the story, face the power of a big company while they independently mine an asteroid [C. J. Cherryh, *Heavy Time, The Company Wars Series No 4* (New York: Warner Books, 1991)]; the *Outside's Chance* (1998), short story by G. Landis [Geoffrey Landis, *Impact Parameter and Other Quantum* (Urbana: Golden Gryphon Press, 2001)] and the *Betting on Eureka* short story of the same author (2005).

[3] Robert Heinlein, *The Rolling Stones* (New York: Ballantine Books, 1985).

[4] Such companies are:

- the *Deep Space Industries*, a company that plans in returning asteroid samples to Earth and establishing completed asteroid mining missions by 2023:

> "Deep Space Industries is an asteroid mining company, 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. These resources, found on easily accessible near earth asteroids, will provide unlimited energy and supplies for a growing space economy." (Deep Space Industries (May 2015), online: <http://deepspaceindustries.com/business/>);

- the *Kepler Energy and Space Engineering LLC*, which:

> "is headed by several veterans of the Aerospace Industry, which aims to return ~ 40 metric tons of raw asteroid regolith to LEO (250 km from Earth, the same as the ISS) by the end of the decade using the "keep it simple" principle: KESE plans to make full use of existing proven space technologies and hardware from the Dawn, Hyabusa, and Rosetta Missions, which can be very easily adapted to Cornucopia" (Kepler Energy and Space Engineering LLC (May 2015), online: <http://www.kesellc.com/>);

- the *Shackleton Energy Company* that uses the moto "We Are Going Back to the Moon to Get Water" (Shackleton Energy (May 2015), online: < http://www.shackletonenergy.com/overview/#goingbacktothemoon>), and;

rudderless ships in lack of a framework that grants ownership of parts of outer space. The miners of Heinlein's fantasy obviously did not question whether the extracted minerals belonged to themselves or to humankind. Neither did they pry the legality of owning and selling such materials; nor did they interrogate a potential infringement of law by doing so. Nonetheless, such questions occupy the forefront of current commercial space activities and legislation. This thesis examines the legality of property rights acquisition on parts of outer space in light of its (legal) status, as evolved over the passage of time and as interpreted today.

Outer space made its appearance in international law in the late 60's, when the launch of Sputnik I[5] served as a springboard to arouse humankind's interest in space affairs.[6] Back then, space activities were revolved around the exploration and exploitation of outer space as an area miles away from commercial exploitation.[7] Indeed, the reasons behind the use and exploration of outer space were enshrined in the 1348 (XIII) UN Resolution as adopted by the General Assembly for the first time in 1958.[8] The Resolution perceived the exploration and exploitation of outer space

- the *Planetary Resources Company* which has as objective to bring "natural resources of space within humanity's economic sphere of influence, propelling us into the 21st century and beyond…today", (Planetary Resources Inc. (May 2015), online: <http://www.planetaryresources.com/company/overview/>).

[5] Francis Lyall & Paul B. Larsen, *Space Law; A Treatise* (USA, England: Ashgate, 2009), at 1: "The launch of Sputnik I on 4 October 1957 took the attention of the world."

[6] Although the launch of Sputnik I appealed the interest for further exploration of outer space, human presence in it had already been foreseen by Tsiolkovsky in 1903; see, Fabio Tronchetti, *Fundamentals of Space Law and Policy* (New York, Heidelberg, Dordrecht, London: Springer, 2013), at 4; Ricky J. Lee, "Reconciling International Space Law with the Commercial Realities of the Twenty-first Century" (2009) 4 Sing, J. Int'l & Comp. L. 194, at 194.

[7] Indeed, the preamble of the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, signed on 27 January 1967, 610 UNTS 205 (entered into force 10 October 1967) [hereafter "Outer Space Treaty"] takes into account scientific uses of outer space without mentioning a potential commercial exploitation of it: "*Desiring* to contribute to broad international cooperation in the scientific as well as the legal aspects of the exploration and use of outer space for peaceful purposes". One more example in the same line is the convention of the establishment of the European Space Agency [hereafter "ESA"] that almost ten years later describes the objectives of the agency by emphasizing the promotion of scientific exploration of outer space while it omits to expressly mention commercial uses of it: "The purpose of the Agency shall be to promote […] co-operation […] in space research and technology […], with a view to their being used for scientific purposes and for operational space applications systems […]", see., Art. II ("Purpose") of the Convention of Establishment of a European Space Agency, C*onvention of Establishment of a European Space Agency*, signed on 30 May 1975, CSE/CS(73)19, rev.7 (entered into force on 30 October 1980) [hereafter "ESA Convention"], online: <http://esamultimedia.esa.int/multimedia/publications/SP-1317-EN/pageflip.html>.

[8] *Question on the peaceful use of outer space*, GA Res 1348, UNGAOR, 13th Sess, UN Doc A/Res/1348 (1958).

as serving the interests of all humankind; "*desiring* to promote energetically the fullest exploration and exploitation of outer space for the benefit of all mankind" reads one of the Resolution's most important concepts that set the *ratio* for the future development of a big part of *corpus juris spatialis*.[9] Soon after, the exploitation of outer space was envisaged as a necessity and hence welcomed ever since; however, the context of this exploitation was still not clarified at the time. Technological and scientific immaturity during that era, did not allow the farfetched advancements of science fiction to come true; hence, the reason for further clarification for the "exploration" of outer space was not existent.

Later UN Resolutions[10] moved a step forward by justifying the need to exploit outer space for "the betterment of all mankind",[11] inserting the term "use" next to the term "exploration" for

[9] The rationale of this Resolution was used even many years later to orientate the programming of various space activities, such as the UN Biennial programme plan for the period of 2008-2009: "The programme evolved as a result of the recognition, by the General Assembly in its Resolution 1348 (XIII), of the importance of using outer space exclusively for peaceful purposes and of the need to international cooperation in the conduct of activities"; *Biennial Programme Plan and Priorities for the Period 2008-2009*, GA, 61st Sess, UN Doc A/61/6/Rev. 1 (2007), at 55; the importance of the UNGA Resolutions lies in the fact that they are almost always respected by States, since they express the will of the United Nations. However, they are not legally binding instruments; see, United Nations Foundation, "The General Assembly" (as of June 2015), online: United Nations Foundation <http://www.unfoundation.org/what-we-do/issues/united-nations/the-general-assembly.html?referrer=https://www.google.ca/>: "Although General Assembly Resolutions are non-binding on member States, they often have a dramatic and lasting effect"; Ian Brownlie, *Principles of Public International Law* (New York: Oxford University Press, 2008), at 15: "In general these Resolutions are not binding on member States, but when they are concerned with legal norms of international law, then acceptance by a majority vote constitutes evidence of the opinions of governments in the widest forum for the expression of such opinions."

[10] For example: *International cooperation in the peaceful uses of outer space*, GA Res 1472, UNGAOR, 14th Sess, UN Doc A/Res/1472 (1959); *International co-operation in the peaceful uses of outer* space, GA Res 1721, UNGAOR, 16th Sess, Un Doc A/Res/1721 (1961); *International cooperation in the peaceful uses of outer space*, GA Res 1802, UNGAOR, 17th Sess, UN Doc A/Res/1802 (1962); *Declaration of legal principles governing the activities of States in the exploration and use of outer space*, GA Res 1962, UNGAOR, 18th Sess, UN Doc A/Res/1962 (1963) and *International Cooperation in the peaceful uses of outer space*, GA Res 1963, UNGAOR, 18th Sess, Un Doc A/Res/1963 (1963).

[11] *International co-operation in the peaceful uses of outer* space, GA Res 1721, UNGAOR, 16th Sess, Un Doc A/Res/1721 (1961): "*Believing* that the exploration and use of outer space should be only for the betterment of all mankind […]".

the first time,[12] while pivoting the latter around a sharing of benefits "irrespective of the stage of the economic or scientific development" of States.[13]

The framing of the "use and exploration*"* of outer space, which later built one of the main articles in the Outer Space Treaty,[14] took place in 1961 with the adoption of the 1721 (XVI) Resolution:[15]

> "The General Assembly, […] 1. Commends to States for their guidance in the exploration and use of outer space the following principles: […]; (b) Outer space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation".[16]

Absolute and strict wording that prohibits national appropriation of outer space and celestial bodies and initiates the characterization and delimitation of "use and exploration" of outer space.[17] Seemingly, the intentions of the international community at the time regarded outer space as destined to be used and exploited for the "benefits of all mankind" while remaining away from national appropriation.

Conversely, the maxim "you cannot eat your cake and have it too" illustrates a criticism on this view by taking into account future evolutions in space industry and the subsequent mentality adopted by space farers. Indeed, back in the 60s, humankind could enjoy both "eating the cake" and the "cake" itself; no need to mine asteroids; no need to look for extraterrestrial resources; no reason to question to whom stars belonged.[18] Both the wording "use and exploration" and the

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[12] *Ibid*.
[13] *International cooperation in the peaceful uses of outer space*, GA Res 1472, UNGAOR, 14th Sess, UN Doc A/Res/1472 (1959): "[…] and to the benefit of States irrespective of the stage of their economic or scientific development"; Edwin W. Paxson III, "Sharing the benefits of Outer Space Exploration: Space Law and Economic Development" (1992-1993) 14 Mich. J. Int'l L. 487, at 503.
[14] Art. I of the Outer Space Treaty: "The exploration and use of outer space, […], shall be carried out for the benefit and for the interests of all countries […]."
[15] GA Res 1721, *supra note* 11.
[16] See para. 1 of the Resolution.
[17] GA Res 1721, *supra note* 11.
[18] The use of outer space for exploitation of natural resources started being envisaged in *the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, signed on 18 December 1979, G.A. Res. 34/68, U.N. GAOR, 34th Sess., Supp. No. 46, U.N. Doc. N34/664 (1979) (entered into force on 11 July 1984) [hereafter "Moon

obligation of space actors to refrain from national appropriation remain today as cores and directives in the body of space law.[19] However, the context that surrounds their perception differs from concepts of the past; at the time, the "use" and "exploitation" of outer space were meant to occasion mere scientific activities far from commercial alignments.[20] Rotating the telescope to the 21st century, the change in mentality is apparent; major space faring nations hunt for a commercial exploitation of outer space whereas private space actors make giant leaps on this turf.[21]

Looking back to Heinlein's scenario and in view of the need to clarify the legal framework of property rights in outer space – and even more of private ownership on celestial bodies – a series of questions arise. First: "What is the legal status of outer space and celestial bodies in terms of sovereignty and jurisdiction, and what kind of legal controls can derive therefrom?" Second: "What is the meaning of "use", "exploration" and "exploitation" in light of the provisions of *lex spetialis*?" and, consequently, "Should private ownership be *ab initio* excluded from their scope?"

Agreement"]. The ground, however, for a detailed regulation of the issue was not mature at that time. Thus, no specific agreement on the topic could be achieved. Characteristic is the position of the U.S. that did not sign the Moon Agreement considering that such exploitation of outer space required the prior establishment of an international investment organization to regulate the topic; Philip Harris, "Space Law and Space Resources", online: National Space Society <http://www.nss.org/settlement/nasa/spaceresvol4/spacelaw.html>: "The interpretations of the U.S. negotiators evoke alternative regimes, including an international investment organization which nations could join if they desired. Intelsat, the International Telecommunications Satellite Consortium, is such a model."

[19] These concepts were expressly introduced as principles in the body of space lay by the adoption of the *Declaration of legal principles governing the activities of States in the exploration and use of outer space*, GA Res 1962, 18th Sess, UN Doc A/RES/18 (1962):

> "The General Assembly, […], *Solemnly declares* that in the exploration and use of outer space States should be guided by the following principles: (1) The exploration and use of outer space shall be carried on for the benefit and in the interests of all mankind, […], (3) Outer space and celestial bodies are not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."

See also, Thomas Adams, "The Outer Space Treaty: An Interpretation in Light of the No-Sovereignty Provision" (1968) 9 Harv. Int'l L. J. 140, at 141.

[20] For the establishment of the concept see, Vladimir Kopal, "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies" (2008), online: United Nations Audiovisual Library of International Law <http://legal.un.org/avl/pdf/ha/tos/tos_e.pdf>: "Example for the regulation of space activities was provided by the Antarctic treaty […], which laid down the principles of the legal exploration of Antarctica on the experience gained during the International Geophysical year."

[21] *Supra note* 4.

And, last: "What are the main legal barriers caused to private commercial activities by the currently existing provisions and how could the latter be outreached?"

This thesis aims to raise and answer these questions through its three chapters. The first chapter delimits the problem and its dimensions by framing the background of the main question to be answered: "Can private entities own parts of outer space?" The second chapter tackles general issues as to the legal status of outer space in terms of sovereignty and jurisdiction over it, while the third chapter attempts to answer the main questions on the basis of the second chapter's findings.

II. The background

Investigating the background and the existing rules before solving a legal problem is always an initial approach to resolve any issue at hand. Albert Einstein denotes that "you have to learn the rules of the game and then you have to play better than anyone else".[22] In order to familiarize oneself with the rules, however, laying out the background of the problem, the examination of the possible interactions among the elements that frame it is of essence. The issue of property rights in outer space, specifically that of private ownership on celestial bodies, requires a placement in light of the practical expediency of celestial bodies for terrestrial needs as well as in view of the relationship among space actors, space activities and the respective legal framework.

A. The Importance of Celestial Bodies for meeting Earthly Needs

[22] Taylor Hartman, *The People Code: It's All about your Innate Motive* (New York: Scribner, 2007), at 44.

"One of the most significant contributions of the Apollo Missions was confirming the presence of Helium-3 on the Moon"[23] states Harrison Schmitt, an astronaut of the National Aeronautics and Space Administration of the United States [hereafter "NASA"] who set foot on the Moon.[24] Helium-3, Hydrogen, Oxygen, Dioxide and Carbon are few of the scarce natural resources believed and proved to exist in outer space;[25] indeed, scientists affirm the existence of such valuable resources in outer space together with iced water on the poles of celestial bodies.[26] Whereas the extraction of space natural resources proves to be feasible in terms of technology,[27] a simultaneous depletion of the respective terrestrial resources welcomes such exploitation for the enhancement of terrestrial sustainability and energy economization.[28] Respectively, the European Environment Agency [hereafter "EEA"][29] notices that the excessive use of terrestrial resources for

[23] "Helium-3: One of the most Significant Contributions of the Apollo Missions" (12 October 2012), online: NASA <http://www.nasa.gov/centers/wstf/news/2012/helium3.html#.VYxb0flVhBc>; additionally, Posey, a Member of the House Science, Space and Technology Committee, has stated that "Asteroids are excellent potential sources of highly valuable resources and minerals"; Leonard David, "Mining the Moon? Space Property Rights still Unclear, Experts Say" (25 July 2014), online: Space.com <http://www.space.com/26644-moon-asteroids-resources-space-law.html>.

[24] Astronaut Dr. Schmitt was the "lunar module pilot" for Apollo 17 mission and a "backup lunar module pilot" for the Apollo 15 mission; "Biographical Data – Harrison H. Schnitt", online: NASA <http://www.jsc.nasa.gov/Bios/htmlbios/schmitt-hh.html>.

[25] Canadian Space Agency [hereafter "CSA"], "Regulatory and Economic Aspects of the Exploitation of Outer Space Resources", Study, (St. Hubert, Quebec, Canada, March 2013), at 5; Francis Lyall, "On the Moon" (1998) 26 J. Space L. 129, at 192-130.

[26] *Activities being carried out or to be carried out on the Moon and other celestial bodies, international and national rules governing those activities and information received from States parties to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies about the benefits* of adherence *to that Agreement*, GA COPUOS 2012, 51st Sess, UN Doc A/AC.105/C.2/L.285 (2012).

[27] Mark J. Sonter, *The Technical and Economic Feasibility of Mining the Near Earth Asteroids* (MSc Thesis, University of Wollongong, 1997), at 100-107; "A Possible New Future Alternative to Land Mining", online: Massachusetts Institute of Technology (MIT) <http://web.mit.edu/12.000/www/m2016/finalwebsite/solutions/asteroids.html>; Kurt Anderson Baca, "Property Rights in Outer Space" (1992-1993) 58 J. Air L. & Com. 1041, at 1045.

[28] "Study: Asteroids provide Sustainable Resource" (13 June 2013), online: NASA <https://www.nasa.gov/mission_pages/asteroids/news/asteroidmining.html#.VZLK20bv40w>: "[…] detail one potential path toward developing a self-sustaining, space-based industry that would use resources from asteroids and other celestial bodies to meet the needs of Earth."

[29] EEA is an agency that was established by the European Union in 1990 and provides information about the condition of the environment and the environmental policies that are being followed; European Environmental Agency <http://www.eea.europa.eu/about-us>.

purposes of production and consumption is burdensome not only for Europe but also globally.[30] Conjointly, scientists state that the resources detected in celestial bodies can both support earthly needs and contribute to space missions which are far from being supplied through the use of terrestrial material;[31] even since 1984, NASA communicates this possibility by stating in one of its reports:

> "The idea of using the energy, environments, and materials of space to support complex activities in space has been implicit in many proposals and actions both before and during the age of space flight. […] the deep gravity well of the Earth makes it difficult and expensive to haul all material supplies, fuel, and energy sources into space from the surface of the Earth; it is clearly more efficient to make maximum use of space resources".[32]

In turn, the recent ESA's Rosetta mission reaffirms the technological possibility of landing on celestial bodies (comets in this case)[33] and brings into light that by "using the high-Resolution science camera on board ESA's Rosetta spacecraft, scientists have identified more than a hundred

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[30] "The Overall Environmental Impact of Europe's Resource Use Continues to Grow" (16 October 2014), online: EEA <http://www.eea.europa.eu/soer/synthesis/synthesis/chapter4.xhtml> :

> "Most environmental pressures […] are driven — directly or indirectly — by the increasing use of natural resources for production and consumption patterns that leave an environmental footprint in Europe and elsewhere in the world. Furthermore, the related depletion of our stocks of natural capital and its links to other forms of capital is putting at risk the sustainability of Europe's economy and social cohesion".

[31] "NASA Commercial Space Transportation Study", online: NASA <http://www.hq.nasa.gov/webaccess/CommSpaceTrans/SpaceCommTransSec39/CommSpacTransSec39.html>:

> "Some ET [extraterrestrial resources] resources are considered potentially valuable on earth, but are difficult and expensive to obtain. He3, a lunar regolith production product, is an attractive fuel for nuclear fusion reactors. Asteroids may offer platinum production and low concentrations of gold. […] Some ET resources are considered for their potential use in space. Liquid oxygen, for example, can be produced on the lunar surface and used in space to enhance planetary exploration and lunar base missions. At this time it is envisioned that the large-scale use of ET resources will begin in space and not on earth."

[32] Mary Fae McKay, David S. McKay, Michael B. Duke, Eds., *Space Resources* (Washington DC: NASA Scientific and Technical Information program, 1992), online: NASA <http://ares.jsc.nasa.gov/exploration/HumanExplore/space_resources/Master/SpaceResources.pdf>, at 1.

[33] "Rosetta Arrives at Comet Destination" (3 August 2014), online: ESA <http://www.esa.int/Our_Activities/Space_Science/Rosetta/Rosetta_arrives_at_comet_destination>.

patches of water ice, a few meters in size, on the surface of Comet 67P/Churyumov-Gerasimenko".[34]

Thus, the scientifically proven existence of such valuable resources in celestial bodies, connected to the technological feasibility to harvest them, renders the exploitation of such resources indispensable for the amelioration of the way in which terrestrial resources are managed and for the promotion of a sustainable development.[35] The discussion is emerging specifically with regard to developing countries, where the depletion of natural resources[36] is aggravated by the augmentation of their populations, matter instigating discussions in the United Nations for many years.[37] Hence, the exploitation of celestial bodies through the extraction of their natural resources can improve terrestrial life by serving earthly needs and fulfilling the objective enshrined in the 1962 UN Resolution[38] recognizing that the "exploration and use of outer space should be carried for the betterment of mankind and for the betterment of States […]".[39]

B. The Triangle of Space Actors, Space Activities and Space Law as the Rationale of the Thesis

[34] "Exposed Ware Ice Detected on Comets Surface" (24 June 2015), online: ESA <http://blogs.esa.int/rosetta/2015/06/24/exposed-water-ice-detected-on-comets-surface/>.

[35] *List of space-related initiatives and programmes carried out by member States of the Committee on the Peaceful Uses of Outer Space and within the United Nations system that respond to specific recommendations contained in the Johannesburg Plan of Implementation of the World Summit on Sustainable Development*, Part V, United Nations Coordination of Outer Space Activities [hereafter UNCOSA], UN Doc (2006), online UNCOSA <http://www.uncosa.unvienna.org/uncosa/en/wssd/index.html>.

[36] International Academy of Astronautics [hereafter "IAA"], *Space Mineral Resources: Challenges and Opportunities, Preliminary Findings and Recommendations for Heads of Space Agencies* (Paris: IAA, 2015), at 6: "It is clear that the world is running out of minerals and energy. Minerals are, by definition, a non-renewable resource. Humanity's consumption of products continues to increase as global poverty is replaced by an emerging global middle class – people who desire to live a materially affluent lifestyle."

[37] "Global Issues-Water", online: UN <http://www.un.org/en/globalissues/water/>, "The United Nations has long been addressing the global crisis caused by insufficient water supply to satisfy basic human needs and growing demands on the world's water resources to meet human, commercial and agricultural needs".

[38] GA Res 1962, *supra note* 19.

[39] *Ibid.*

As already conferred, the contribution of outer space activities to the amelioration of man's life had been noticed since 1958, when the 1348 (XIII) UN Resolution[40] stated, "recent developments in respect of outer space have added a new dimension to man's existence and opened new possibilities for the increase of his knowledge and the improvement of his life".[41]

It is therefrom derived that the "improvement of man's life" constitutes, from the outset of space law, one of the major incentives to build and interpret *corpus juris spatialis*.[42] The meaning of the notion "improvement" and its interpretation according to the context of each era are two of the most important directives to orientate the spirit of space law activities. While a few decades ago scientific exploration of outer space was the main – if not the only – space-related means to ameliorate the quality of man's life,[43] today the concept of "betterment" seems to be more adequately served through the engagement of commercial entities in the field of space activities.[44]

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[40] *Question on the peaceful use of outer space*, GA Res 1348, UNGAOR, 13th Sess, UN Doc A/Res/1348 (1958).

[41] It is worth mentioning that the objective of the Resolution was the one that founded the *ad hoc* Committee on the Peaceful Uses of Outer Space. It is important, thus, to keep in mind that the usefulness of space activities and consequently their consideration from a commercial point of view have constituted an incentive for the creation of *corpus juris spatialis* as it is established today; respectively see: *Question on the peaceful use of outer space*, GA Res 1348, UNGAOR, 13th Sess, UN Doc A/Res/1348 (1958) that states: "The General Assembly, […] *Conscious* that the recent developments […] have added a new dimension […] and opened the possibilities for the increase of his knowledge and the improvement of his life, […], Establishes an *ad hoc* Committee on the Peaceful Uses of Outer Space composed of the representatives of […]."

[42] *Terms of reference and methods of work of the working group on the long-term sustainability of outer soace activities of the scientific and technical subcommittee*, GA COPUOS Working Paper, UN Doc A/Ac.105/C.1/L.307/Rev1 (2011):

> "[…] the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space recognized the importance of space science and space applications for improving our fundamental knowledge of the universe, and improving the daily lives of people worldwide through environmental monitoring, management of natural resources […]".

[43] In the past, the main – if not the only – commercial use of outer space consisted in the functions of telecommunications satellites. Such commercial exploitation of outer space took place in 1965 for the first time; I. H. Ph. Diederiks-Verschoor & W. Paul Gormley, "The Future Legal Status of Nongovernmental Entities in Outer Space: Private Individuals and Companies as Subjects and Beneficiaries of International Space Law" (1977) 5 J. Space L. 125 at 133: "The world's first operational commercial satellite, the Early Bird, was launched on April 6, 1965 by COMSAT […]".

[44] Nayef R. F. Al-Rodhan, *Meta-Geopolitics of Outer Space: An Analysis of Space Power, Security and* Governance (New York: Palgrave Macmillan, 2012), at 49: "However, the high cost of space programmes coupled with increasing international competition opened up space to private actors and initiated its commercialization".

Thus, the commercialization of outer space satisfies both the initially introduced concepts of space law as well as the current needs of the humankind.[45] Indeed, as already discussed, the depletion of terrestrial natural resources, the augmentation of Earth's population[46] and the objective of building the grounds for a sustainable development[47] constitute, nowadays, the main incentives for a commercial exploitation of outer space.

In this respect, plans for the involvement of space actors in the extraction, elaboration and transfer of space minerals to Earth currently constitute the most important development in the area of outer space commercial exploitation.[48] However, the parameters that frame such activities are numerous; accepting that technology allows this endeavor to come true, legal questions arise as to the rights and obligations of such space actors and as to the legality of such activities.

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[45] Myland Pride, "Fiscal Uncertainty, Global Challenge, and the Value of Commercialization" (17 May 2015), online: Space News <http://spacenews.com/fiscal-uncertainty-global-challenge-and-the-value-of-commercialization/>.

[46] "Current Population is Three Times the Sustainable Level", online: World Population Balance <http://www.worldpopulationbalance.org/3_times_sustainable>, where it is stated that:

> "Current global population of over 7 billion is already two to three times higher than the sustainable level. Several recent studies show that Earth's resources are enough to sustain only about 2 billion people at a European standard of living. An average European consumes far more resources than any of the poorest two billion people in the world. However, Europeans use only about half the resources of Americans, on average."

[47] Robert Muller, who works for the Kennedy Surface Systems Office, supports that the exploitation of space minerals from celestial bodies can lead to a self-sustained production of minerals that can meet the needs of Earth; "Study: Asteroids Provide Sustainable Resource" (13 June 2013), online: NASA <https://www.nasa.gov/mission_pages/asteroids/news/asteroidmining.html#.VZ6AJPlVhBc>; Barton A. Larson, Ed., *Sustainable Development Research Advances* (New York: Nova Science Publishers, Inc., 2007), at 181.

[48] *Supra note* 4; Ozgur Gurtuna, *Fundamentals of Space Business and Economics* (New York: Springer, 2013), at 83, 84 that states :

> "The recently announced Stratolaunch Systems venture, the successful mission of SpaceX's Dragon spacecraft to the ISS and the partnership between Planetary Resources and Virgin Galactic to launch a space telescope as a first step for asteroid mining are just some of the recent developments that will shake up the industry. It's still very early to see if these ventures will succeed in securing the required funding and overcome all major technical and regulatory hurdles to achieve long-term success. What's clear, however, is that a new way of doing business is finally here: taking calculated risks, using private funding and combining the critical expertise of the private sector in a self-organizing way."

As akin space actors qualify both governmental and non-governmental entities; this derives from Art. VI of the Outer Space Treaty, according to which, space activities can be undertaken by both governmental and private entities, although States remain always responsible for both types of activities.[49] However, in practice, private entities seem more eager to engage in the aforesaid commercial activities as opposed to current governmental initiatives;[50] "The number of private sector initiatives related to space exploration is growing. ESA intends to opening up new opportunities for partnership with the private sector, complementing its traditional role as a customer," states ESA.[51] Nevertheless, the rights and obligations of such entities are to be examined under the limits posed by a state-oriented body of laws[52] (*i.e.*, the provisions of the five UN space law treaties that regulate international responsibility for space actors).[53] Although established decades ago and under different perspectives, the treaties still establish the main body

[49] Art. VI of the Outer Space Treaty:

> "States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, 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."

[50] For example both NASA and ESA seek the participation of the private sector in order to undertake such activities, while the respective private investment plans seem to rapidly grow; GA Res 1962, *supra note* 4; "NASA bets on private companies to exploit moon's resources" (9 February 2014), online: NASA <http://phys.org/news/2014-02-nasa-private-companies-exploit-moon.html>; Zach Meyer, "Private Commercialization of Space in an International Regime: A Proposal for a Space District" (2010) 30 Northwestern j. if Int'l L. and Buss. 241, at 246; even the establishment of public-private venture for this purpose entails a private character, see, Lauren Shaw, "Asteroids, The New Western Frontier: Applying Principles of the General Mining Law of 1872 to Incentivize Asteroid Mining" (2013) 78 J. Air L. & Com. 121 at 127; Jonathan Thomas, "Privatization of Space ventures: Proposing a Proven Regulatory Theory for Future Extraterrestrial Appropriation" (2005) 1 Int'l L. & Mgmt. Rev. 191, at 193.

[51] ESA, *Exploring Together, ESA Space Exploration Strategy* (The Netherlands: ESTEC, 2015), at 26.

[52] The responsibility system of the *corpus juris* of space law is state-oriented, since it establishes state responsibility for both public and private space activities in Art. VI of the Outer Space Treaty.

[53] The treaties are: The Outer Space Treaty; The *Agreement the Rescue of Astronauts, the Return of Astronauts and Return of Objects Launched into Outer Space*, signed on 22 April 1968, 19 UST 7570, 672 UNTS 119 (entered into force on 3 December 1968) [hereafter "Rescue and Return Agreement"]; the *Convention on International Liability for Damage Caused by Space Objects*, signed on 29 March 1972, 24 UST 2389, 961 UNTS 187, TIAS No. 6347, 6 I.L.M. 386 (entered into force on 1 September 1972) [hereafter "Liability Convention"]; the C*onvention on Registration of Objects Launched into Outer Space*, signed on 6 June 1975, 28 U.S.T. 695, 1023 UNTS 15, TIAS No. 8480, 14 ILM 43 (entered into force on 15 September 1976) ["hereafter "Registration Convention"], and; the Moon Agreement; see online at UN Office for Outer Space Affairs (hereafter "UNOOSA") <http://www.unoosa.org/pdf/publications/STSPACE11E.pdf>.

of space law; [54]a modernized interpretation of them seems, however, essential for the fulfillment of the current objectives of space activities.[55]

Such an interpretation should take into account an up-to-date view of commercial space activities and try to surpass the reef that inhibits such commercial use: The third leg of the triangle (*i.e.*, the provisions of *lex spatialis* that regulate property rights in outer space). A reasonable question which would follow would be: "Why is there a need to examine the issue of property rights in outer space?" The answer lies in the lack of legal certainty of the current regime,[56] under which outer space is characterized as beyond state sovereignty and beyond appropriation.[57] However: "What does the latter notion refer to?" "Does it prohibit only public or also private ownership in outer space?" And, if in the affirmative: "How could this blockage be transcended for the sake of an unhindered commercial exploitation of outer space?"

Taking into account the demands of the market and the way in which commercial activities flourish, the ownership of the objects of commercial activities is the least common denominator among all kinds of legal commercial activities that involve the transfer of goods.[58] Thus, the scenario for this study is as follows:

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[54] MA Xinmin, "The Development of Space Law: Framework, Objectives and Orientations" (17 November 2014), online: UNOOSA <http://www.unoosa.org/pdf/spacelaw/activities/2014/splaw2014-keynote.pdf>; "Space Law", online: UNOOSA <http://www.unoosa.org/oosa/en/ourwork/spacelaw/index.html>.

[55] International Law Association [hereafter "ILA"], Space Law Committee, Final Report on the Review of Space Treaties in View of Commercial Space Activities – Concrete Proposals (New Delhi: 2002) at 3, that states:

> "In his view this Declaration [the Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interests of all States, Taking into Particular Account the Needs of the Developing Countries, signed on 13 December 1996, UNGAOR, 83rd Plenary Meeting, UN Doc A/RES/51/122 (1996)] proclaims an authoritative interpretation of the position of the States Parties concerning the permissible economic uses of Outer Space".

[56] NASA, *supra note* 23.

[57] Art. II of the Outer Space Treaty: "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."

[58] See, for example, the NASA and ESA space objectives and strategies both of which take into account the need to commercialize outer space activities and enter the game by following the rules and demands of the market; NASA Strategic Plan 2014, online: NASA <https://www.nasa.gov/sites/default/files/files/FY2014_NASA_SP_508c.pdf>;

> «In the quest to locate a way to enable commercial exploitation of outer space natural resources, *i.e.*, mining of valuable minerals in outer space, essential appears the need to strike a balance among the three legs of the triangle: the commercial objectives of private space actors, the form of such space activities, and the place of the currently existing legal framework regulating property rights in outer space. Such a balance can be achieved either by an adequate interpretation of the currently existing provisions or by proposals for future relevant legislation».

Consequently, the major rationale of the thesis resides in the need to find equilibrium between the need to commercially exploit outer space "for the benefit of all mankind" and for the "improvement of man's life" and the need to respect space law principles and age-surviving concepts from the perspective of property rights acquisition on parts of outer space.

C. Methodological Approach

The analysis of such an issue is a complex one which requires a multidimensional approach. The reason why this issue needs to be addressed does not only serve legal certainty; it also serves the facilitation of commercial private initiatives that definitely seek for a similar legal certainty rendering an interdisciplinary approach necessary.[59] Thus, concepts and needs deriving from current private initiatives which require the existence of property rights on parts of outer space will be examined in an effort to illuminate the legal feasibility of such rights by laying the analysis trans-systemic at the same time.

Furthermore, a simultaneous comparative approach is necessary since similar problems have also surfaced in other legal regimes such as the law of the sea and the law governing the regions of Antarctica – areas that share similar characteristics, uses and concerns. Thus,

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ESA, "ESA's Objectives and Priorities - The Stakes in the Space Sector", online: ESA <http://www.esa.int/esapub/br/br114/br114obj.htm>.

[59] Interdisciplinarity in this sense entails the examination of commercial objectives and their use as directives to illustrate which the current space industry expectations and needs are in terms of their legal background; for a general definition of this method see, Mathias Siems, "The Taxonomy of Interdisciplinary Legal Research: Finding the Way out of the Desert" (2009) 7 J. of Commonwealth L. and Legal Education 5-17.

experiences from these areas will create analogies to draw illuminative lines as to the interpretation that has to be followed and that will simultaneously give a comparative and empirical touch to the analysis.[60]

However, the starting point of the survey will always be doctrinal by presenting and analyzing the currently existing provisions of space law from a normative perspective[61] in order to delineate the limits of the interpretation while staying as close as possible to the letter of law. The historical background of these provisions as well as the legislative intentions hidden behind the words will serve as directives for a thorough interpretation.[62] Furthermore, because no nation or private entity has yet actually realized activities that require property rights on celestial bodies, the theoretical background to frame the analysis will always be directed by potential legal needs of such activities on the basis of the currently existing commercial plans. Literature, well-known legal scholarship and jurisprudence of international law will always grant or deny validity to each attempted interpretation, since they all constitute sources of international law according to Art. 38 of the Statute of the International Court of Justice [hereafter "ICJ"].[63]

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[60] The word "empirical" is used here to highlight the practical significance that the examples of these fields of law have in the interpretation of space law; for a general definition of the empirical legal research methods see, Lee Epstein & Andrea D. Martin, *An Introduction to Empirical Legal Research* (Oxford: Oxford University Press, 2014), at Ch. 1.

[61] Terry Hutchinson, "Defining and Describing What We Do: Doctrinal Legal Research" (2012) 17 Deakin L. Rev. 83, at 101.

[62] For the importance of the historical background in the interpretation of international law see, Myres S. McDougal, "The International Commission's Draft Articles upon Interpretation: Textuality Redivivus" (1967) The Am. J. of Int'l L. 992, at 999-1000, citing Harvard Research in Int'l L. (1935) 29 A.J.I.L, at 937:

> "The historical background of the treaty, *travaux préparatoires*, the circumstances of the parties at the time the treaty was entered into, the change in these circumstances ought to be effected, the subsequent conduct of the parties in applying the provisions of the treaty, and the conditions prevailing at the time interpretation is being made, are to be considered in connection with the general purpose which the treaty is intended to serve."

[63] *Statute of the International Court of Justice*, annexed and integrated to the Charter of the UN [hereafter "UN Charter"] on 18 April 1946; Art. 38, para. 1:

> "The Court, whose function is to decide in accordance with international law such disputes as are submitted to it, shall apply:

III. Conclusions

Having theoretically framed the problem, it could be argued that the heroes in Heinlein's story are not far from embodying the role of the current space actors. Commercialization of outer space, coupled with the terrestrial needs that require such commercialization, leads to a discussion that must take into account both the legal and the practical dimensions of the problem. Indeed, this scenario allows both science fiction and fantasy to come true;[64] the only piece that is missing from the puzzle is the acceptance that property rights can legally be established on parts of outer space, a statement that frames the thesis of this study.

The chapter that follows constitutes the bridge between setting the background to and the study of the problem as it focuses on the legal status of outer space that will serve as a steering line for the rest of the analysis.

a. international conventions, whether general or particular, establishing rules expressly recognized by the contesting States;
b. international custom, as evidence of a general practice accepted as law;
c. the general principles of law recognized by civilized nations;
d. subject to the provisions of Article 59, judicial decisions and the teachings of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law."

[64] Clarke, *supra note* 1.

Chapter II: Setting the Background
The Legal Status of Outer Space and Celestial Bodies

"*And then, the Earth being small, mankind will migrate into space, and will cross the airless Saharas which separate planet from planet and sun from sun. […] Finally, men will master the forces of Nature; they will become themselves architects of systems, manufacturers of worlds*".[65]

I. Introduction

Having illustrated the rationale of this thesis and emphasized the main questions that constitute the core of the research, the analysis of the legal status of outer space seems critical. The legal controls that might exist in outer space, one of which is the establishment of property on celestial bodies, derive from the status of outer space; the less the restrictions that apply on it the broader the ambit of legal controls.

The purpose of this chapter is to yield the floor to the next one by setting the stage through the analysis of the basic provisions, principles and concepts of space law on which the status of property rights in outer space is based. The legal nature of outer space in terms of both sovereignty and jurisdiction, founds the milestone on which the discussion about property rights can be relied and through which the conclusions of such discussion can be justified. This chapter is divided into two parts; while the first discusses the status of outer space from the perspective of sovereignty, the second studies the jurisdictional controls over outer space and its parts, as an effect of the previously examined sovereignty status. Indeed, in order to "master the forces of nature",[66] the limits set by nature itself must be examined so that human presence in outer space is neither arbitrary nor authoritative.

[65] Winwood Reade, *The Martydom of Man* (London: Kegan Paul, Trench, Trubner & Co., 1872), at 510.
[66] *Ibid.*

II. Outer Space and Celestial Bodies as Areas beyond Sovereignty

The adoption of the Outer Space Treaty by the General Assembly through the 2222 (XXI) UN Resolution in 1966[67] was the result of a series of reports, letters, proposals and draft Resolutions that form the *travaux préparatoires* of the Outer Space Treaty and express the view of the international community as to the legal nature of outer space.[68] "The Moon and other celestial bodies should be free for exploration by all in accordance with international law" and "celestial bodies should not be subject to any claim of sovereignty" read some of the proposals made by the US to the GA concerning the provisions to be included in the Outer Space Treaty[69] - which soon was to be adopted by the UN GA.[70] Also, proposals made by the Soviet Union in June 1966 suggested that article II should read as follows: "Outer Space and celestial bodies shall not be subject to national appropriation by claim of sovereignty, by means of occupation or by any other means".[71]

Both major space-faring nations shared the same objective; an outer space beyond sovereignty and national appropriation. Although this exchange of views constitutes part of the *travaux préparatoires* of the Outer Space Treaty, it reveals the way in which outer space was regarded by these nations.[72] According to Art. 32 of the Vienna Convention on the Law of the

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[67] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, GA Res 2222, UNGAOR, 21st Sess, UN Doc A/Res/2222 (1966).

[68] For example the 1966 USA Proposal to the UN-COPUOS concerning the establishment of the Outer Space Treaty [UN Doc A/AC. 105/C.2/L.12]; the United Arab Republic Draft Resolution submitted to UN-COPUOS in 1966 again on the same topic [UN Doc A/AC.105/C.2/L.15], and; the interim report by the Chairman to UN-COPUOS in 1966 [UN Docs A/AC.105/C.2/L.16 and A/AC.105/C.2/L.16/Corr.1], online: UNOOSA <http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/travaux-preparatoires/outerspacetreaty.html>.

[69] *Letter dated 16 June 1966 from the permanent representative of the United States of America addressed to the chairman of the committee on the peaceful uses of outer space*, UN Doc A/AC.105/32 (1966).

[70] GA Res 2222, *supra note* 67.

[71] *Letter dated 11 July 1966 addressed to the chairman of the legal sub-committee by the representative of the USSR*, UN Doc A/AC.105/C.2/L.13 (1966).

[72] The importance of the *travaux préparatoires* lies in the fact that they express the intentions and purposes of the legislators. They are not binding but they can be used to illuminate the interpretation of the text to the creation of which they led; Brijesh Narain Mehrish, "The Role of *Travaux Préparatoires* as an Element in the Interpretation of Treaties – in Light of Article 32 of the Vienna Convention on the Law of the Treaties" in Association of Attenders

Treaties, [73] such documents are welcome in order to accurately interpret the letter of the law. In fact, these concepts characterizing outer space were rendered legally binding in nature through their embodiment in the actual text of the Outer Space Treaty. This satisfied the views of both nations through the wording of Article II, which reads: "Outer Space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation or by any other means".

As it is apparent, the prohibition of state sovereignty in outer space was desired by the most important leading powers of that era. Indeed, the concept of sovereignty could not have been positively established to characterize outer space as a whole or in parts, since it was created to

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and Alumni of the Hague Academy of International Law, *Yearbook of the A.A.A., Vol 40* (The Hague: Kluwer Academic Publishers, 1970), at 44:

> "The "intentions" approach was formulated by the late Sir Hersch LAUTERPACHT in his draft Report for the Institute of International Law in 1950. In the Report LAUTERPACHT had criticized the practice of not consulting the *travaux préparatoires* unless the text was obscure or ambiguous. […] the *travaux préparatoires* not only should habitually be consulted as a legitimate and desirable means to ascertain the intentions of the parties, but this should be done even if the text seemed quite clear and unambiguous."

[73] Vienna Convention on the Law of Treaties, signed on 23 May 1969, UN Doc. A/Conf.39/27 (entered into force on 27 Januray 1980) [hereafter "VCLT"]; Art. 32:

> "Recourse may be had to supplementary means of interpretation, including the preparatory work of the treaty and the circumstances of its conclusion, in order to confirm the meaning resulting from the application of article 31, or to determine the meaning when the interpretation according to article 31 :
>
> (a) Leaves the meaning ambiguous or obscure; or
>
> (b) Leads to a result which is manifestly absurd or unreasonable."

Although the VCLT was drafted after the adoption of the Outer Space Treaty it can be used to interpret the latter since the principles entailed in it reflect custom and are thus binding even for the interpretation of foregoing legal instruments; Mark. E. Villiger, *Commentary on the 1969 Vienna Convention on the Law of the Treaties* (Leiden, Boston: Martinus Nijhoff Publishers, 2009) at 14; Oliver Dorr & Kiirsten Schmalenbach, *Vienna Convention on the Law of the Treaties, a Commentary* (Berlin: Springer-Verlang, 2012), at 572:

> "As part of treaty and customary law, the rule laid down in Art 32 is a dispositive norm, so that the parties to a given treaty, acting in consent, may opt to decide otherwise and agree that for the interpretation of their treaty the use of preparatory work is, for example, to play a more important role. Such can also be stipulated in a multilateral convention, as is done, for example, in Art 14 para 1 lit d VCLT, which binds the valid treaty consent of a State to an intention "expressed during the negotiation"."

govern terrestrial areas; Judge Huber in the "Island of Palmas" case,[74] the first international case in which the definition of sovereignty was framed,[75] observed that "sovereignty in relation to a portion of the surface of the globe is the legal condition necessary for the inclusion of such a portion of any particular state". This definition, however, defines sovereignty as to the "surface of the globe". A subsequent question raised would be whether such a definition could have been attributed to extraterrestrial areas through different provisions in the Outer Space Treaty. The answer is rendered negative; the way to the establishment of territorial sovereignty passes through a series of procedures. As Shaw teaches: "the essence of territorial sovereignty is contained in the notion of title";[76] the establishment of such a kind of sovereignty requires land that is free from occupation (sovereign-free).[77]

On this ground, such an establishment of title cannot be feasible on extraterrestrial areas; the nature of outer space has expressly been accepted as being "in the common interest of all States" as it is stated in a series of UN Resolutions[78] that led to the inclusion of this specific wording in the preamble of the Outer Space Treaty.[79] Consequently, the subject of outer space is humankind, the needs of which outer space is meant to serve. Thus, the concept of territorial

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[74] *Island of Palmas Arbitration* (United States v. The Netherlands) [1928] Report of International Arbitral Awards, Vol II [hereinafter "Island of Palmas Arbitration"], at 838; Malcolm N. Shaw, *International Law* (New York: Cambridge University Press, 2008), at 657.

[75] Shaw, *ibid*.

[76] Shaw, *supra note* 74, at 490.

[77] *Arbitral Award on the Subject of the Difference relative to the Sovereignty over Clipperton Island* (Mexico v. France) [1931] [hereafter "the Cipperton Case"] in (1932) 26 American J. of Int'l Law 390, at 390:

> "By immemorial usage having the force of law, besides the *animus occupandi*, the actual, and not the nominal, taking of possession is a necessary condition of occupation. This taking of possession consists in the act, or series of acts, by which the occupying state reduces to its possession the territory in question and takes steps to exercise exclusive authority there."

[78] GA Res 1472, *supra note* 10.

[79] "*Recognizing* the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes […]".

sovereignty could not have been adapted so as to be attributed to outer space as such, nor to parts thereof.

The non-sovereign nature of outer space was reaffirmed almost ten years after the adoption of the Outer Space Treaty, parallel to the adoption of the Moon Agreement in 1979. Although neither signed nor ratified by many space-faring nations[80] and although signed by sixteen States in total,[81] it still constitutes an indication of the perceptions of the international community as to the nature of outer space.[82] Art. 11 para. 2 of the Moon Agreement provides for the nature of celestial bodies as being "no subject to national appropriation by claim of sovereignty, by means of use or occupation or by any other means". In fact, this article reiterates the provisions of Art. II of the Outer Space Treaty by proving the non-sovereign nature of outer space still desirable.[83] The acceptance of outer space and its components as not abiding by the principles of national sovereignty is also proven through the existence of respective custom.[84]

A. The Case of the Bogota Declaration proving Outer Space as customarily being beyond Sovereignty

[80] The only space faring nation that has signed the treaty is Australia; online: UNODA <http://disarmament.un.org/treaties/t/moon>.
[81] UNODA *ibid*.
[82] Mere signature of a treaty by a state does not render the provisions of a treaty binding upon the signatory state. It indicates, however, "the State's intention to take steps to express its consent to be bound by the treaty at a later date"; UN, *Treaty Handbook* (UN, 2012), at 5; See also Art. 18 of VCLT:

> "A State is obliged to refrain from acts which would defeat the object and purpose of a treaty when:
> (a) it has signed the treaty or has exchanged instruments constituting the treaty subject to ratification, acceptance or approval, until it shall have made its intention clear not to become a party to the treaty; or
> (b) it has expressed its consent to be bound by the treaty, pending the entry into force of the treaty and provided that such entry into force is not unduly delayed."

[83] Art. II of the Outer Space Treaty: "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."
[84] See the case of the *Declaration of the first meeting of equatorial* countries, 3 December 1976 [hereafter "Bogota Declaration"] as it follows.

Custom constitutes one of the fundamental ways in which international law is being shaped and evolved.[85] The same can be argued for international space law, as the latter constitutes a specific field of international law.[86] Article 38 of the Statute of ICJ recognizes custom as a source of international law of a validity equivalent to treaties: "the court whose function is to decide in accordance with international law such disputes as are submitted to it, shall apply: a. […], b. international practice as evidence of a general principle accepted as law, […]". Accordingly, the creation of custom follows a certain state practice coupled with a respective *opinio juris* that forms the binding nature of the norms.[87] Indeed, the ICJ in the "Nicaragua v. United States" case,[88] the case where the definition of custom was accepted to emerge binding law through the establishment of a certain state practice, noted that:

> "In order to deduce the existence of customary rules, the Court deems it sufficient that the conduct of States should, in general, be consistent with such rules, and that instances of state conduct inconsistent with a given rule should generally have been treated as breaches of that rule, not as indicators of a recognition of a new rule".[89]

The above definition is also reflected in an attempt to establish state sovereignty in outer space that occurred in 1976 and demonstrated the customary nature of the non-sovereignty principle that governs outer space. It was at that time that the representatives of eight equatorial States[90] met in Bogota aiming to claim extension of their territorial sovereignty over parts of the

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[85] Hersch Lauterpacht, Ed., *International Law, Collected Papers* (Great Britain: Cambridge University Press, 1975) at 254: "[…] international custom as a source of international law. There is nothing else than the sum total of concordant acts of States […]. These acts are the substance of the purely formal conception of international custom, which without them is a bare idea"; David Tan, "Towards a New Regime for the Protection of Outer Space as the 'Province of All Mankind'" (2000) 25 Yale J. Int'l L. 145, at 170.

[86] Marietta Benko, Willem de Graaff & Gijsbertha Reijnen, *Space Law in the United* Nations (Dordrecht: Martinus Nijhoff Publishers, 1985), at 179: "To begin with, space law is a part of international law, and as such subject to the rules set by international law. Space law is *jus speciale*, whereas international law is *jus generale.*"

[87] Gennadii Mikhailovich Dnilenko, *Law-Making in the International Community* (The Netherlands: Martinus Nijhoff Publishers, 1993), at 137, 138.

[88] *Case Concerning the Military and Paramilitary Activities in and Against Nicaragua* (Nicaragua v. United States of America) [1986] ICJ Report 14 [hereafter "Nicaragua case"].

[89] *Ibid*., at para. 186.

[90] Brazil, Columbia, Congo, Ecuador, Indonesia, Kenya, Uganda and Zaire; see the Bogota Declaration, at 4.

geostationary synchronous orbit.[91] Their main argument to support such claim was based on the geographical position of this orbit (*i.e.,* a position that renders the orbit to seem stable in relation to the orbit of the Earth due to gravitational phenomena that link it to Earth).[92]

It is a fact that the airspace above the territory of States is considered to exist under the respective state sovereignty according to Article 1 of the Convention on International Civil Aviation, signed in Chicago, December 1944 [hereafter "Chicago Convention"] that reads: "every state has complete and exclusive sovereignty over the airspace above its territory". In this case the question that the international community was called to answer was twofold: firstly, whether the geostationary synchronous orbit belongs to airspace or to outer space given the lack of specific boundaries between these two different areas, and; secondly, whether state sovereignty could be extended on this orbit in case that the geostationary synchronous orbit was accepted as part of the outer space.

Although the answer to the first question does not fall within the ambit of the present analysis, it constitutes a major issue triggering both scientific and legal circles.[93] What is worth

[91] *Ibid*., at 1.

[92] *Ibid.*:

> "Equatorial countries declare that the geostationary synchronous orbit is a physical fact linked to the reality of our planet because its existence depends exclusively on its relation to gravitational phenomena generated by the earth, and that is why it must not be considered part of the outer space. Therefore, the segments of geostationary synchronous orbit are part of the territory over which Equatorial States exercise national sovereignty."

[93] No agreement has yet been reached as to the demarcation between outer space and air space. Some scholars support an arbitrary delineation, while some others propose the adoption of the *Von Karman* line (100 km above the surface of the oceans) as a delimitation point. This is the altitude where the air ceases to be dense enough to support the functions of the aircraft – element necessary for the existence of aircraft as provided for in the Annexes to the Chicago Convention. This latter approach considers the type of the object (craft) as indicative of the delimitation point, while other scholars suggest the absence of need for demarcation. See for example the Report of the COPUOS of 1985 that states: "The Committee noted that a variety of vies had been expressed on the question […]. […] some delegations indicated that it was necessary for space law to have a conventionally defined and/or delimited physical area. Other delegations expressed the view that the need for such a definition or delimitation had not yet been established" in *Report of the Committee on the Peaceful Uses of Outer Space*, GA, 40th Sess, UN Doc A/40/20 (Supplement No. 20) (1985), at 14; see also, Paul Dempsey, *Public International Air Law* (Montreal: McGill, 2008), at 246-255; indeed, although a major issue in space law, the discussion does not seem relevant to the topic in question, since celestial bodies exist in areas that are undoubtedly accepted as parts of outer space due to their long distance from the Earth.

noting is the reaction of the international community in its rejection of such sovereignty claims over the orbit in question, accepting the latter as part of the outer space. The case of the Bogota Declaration constitutes the first attempt to ever doubt the non-sovereignty principle on parts of outer space and its immediate rejection reaffirms the already existing relevant custom. Indeed, such precedent satisfies the notion of custom as presented in both the "Nicaragua v. United States" case and in article 38 of the Statute of the International Court of Justice;[94] a well preserved state practice by then is further approved as accompanied by the necessary *opinio juris* expressed through the acceptances of the international community in this case.[95]

Consequently, on both customary and statutory grounds, outer space and the celestial bodies are enjoying a non-sovereign nature. Following the above observations a rational question arises: "What is, ultimately, the legal nature of outer space if the latter is at the same time beyond sovereignty and "in the interest of all States" and what is the respective impact on property rights acquisition?"

B. Outer Space as *Res Communis omnium* v. Outer Space as *Res Nullius*

[94] In both cases, custom is presented as a binding source of international law, the former establishing such nature conventionally, while the later on the basis of practice. The relation between the ICJ Statue and the custom, as directly emerging from state practice, was provided for in para. 174 of the "Nicaragua v. United States" case that states:

> "the existence of principles in the United Nations Charter precludes the possibility that similar rules might exist independently in customary international law, either because existing customary rules had been incorporated into the Charter, or because the Charter influenced the later adoption of customary rules with a corresponding content."

Thus, the non-sovereignty principle in space law is binding no matter which way (treaty or custom) is followed, since both sources of law are substantially identical.

[95] Gbenda Oduntan, *Sovereignty and Jurisdiction in Airspace and Outer Space: Legal Criteria for Spatial Demarcation* (New York: Routledge, 2012), at 303; Gennadii Mikhailovich Danilenko, *Law-Making in the International Community* (The Netherlands: Martinus Nijhoff Publishers, 1993), at 152, amongst others.

Modern approaches as to how outer space should be used pertain to a colonization of outer space, also named "space settlement", which could serve both a better exploitation of it in the benefit of all States and an easier establishment of property rights in it.[96]

> "Those that colonize space will control vast lands, enormous amounts of electrical power, and nearly unlimited material resources. The societies that develop these resources will create wealth beyond our wildest imagination and wield power -- hopefully for good rather than for ill",

states Dr. Ruth Globus.[97] However, colonization of an area or a territory requires the previous establishment of occupation over the area or the territory.[98] For the latter to take place, the area or territory has to qualify the notion *terra nullius*. The term derives from concepts introduced by Roman law that referred to areas without owners.[99] As such, these areas were free to occupation; the same manner was used for colonization of "masterless" territories in the past.[100] Indeed, the question firstly surfaced in the "Western Sahara" case, in which the International Court of Justice stated that "'occupation' was a means of peaceably acquiring sovereignty over territory otherwise

[96] "Space Settlement Basics" (29 April 2013), online: NASA <http://settlement.arc.nasa.gov/Basics/wwwwh.html>:

> "There's $8 trillion worth of iron and nickel, $6 trillion worth of cobalt, and about $6 trillion in platinum-group metals. Once we can easily launch thousands of people into orbit, and build giant solar power satellites, it shouldn't be too difficult to retrieve 3554 Amun and other asteroids to supply Earth with all the metals we will ever need."

[97] *Ibid*.; Dr. Ruth Globus is an official of NASA.

[98] Andrew Fitzmaurice, *Humanism and America, an Intellectual History of English Colonization* (United Kingdom: Cambridge University Press, 2003), at 140; Michael Connor, *The Invention of Terra Nullius* (Adelaide: Macleay Press, 2005), at 47.

[99] Andrew Fitzmaurice, *Sovereignty, Property and Empire, 1500-2000* (United Kingdom: Cambridge University Press, 2014), at 52: "[…] They were, however, captured by one concept, *res nullius*, which stated one relatively simple principle: namely, that which belonged to no one would become the property of the first taker"; Bradley Larschan & Bonnie C. Brennan, "The Common Heritage of Mankind Principle in International Law" (1982-1983) 21 Colum. J. Transnat'l L. 305, at 312-313.

[100] One example is the colonization of South Australia by Great Britain: Australian territory was considered as *terra nullius* by the British and, as being unowned, the British Government retained its ownership on the territory rendering it a British colony; Edwin Hartley Mears, *On British Colonization: Particularly in Reference to South Australia* (G. Mann, 1839).

than by cession or succession; it was a cardinal condition of a valid 'occupation' that the territory should be terra nullius".[101]

Outer space has unsuccessfully been characterized as *terra nullius*; "[…] the Moon and other planets must *prima facie* be regarded as *res nullius* which, like the New World and the continent of Africa at one time, are susceptible to being appropriated as national territory through effective occupation" states Professor Bin Cheng.[102] However, the element that justified the nature of areas similar to outer space as *terrae nullius* was the effective occupation that States could exercise on them. Conversely, the Outer Space Treaty clearly states in its Art. II that outer space, as well as celestial bodies are not subject to occupation. Indeed, this school of thought did not enjoy wide support[103] and, outer space started being regarded as *res communis omnium*.[104] This

[101] *Western Sahara Case,* Advisory Opinion, ICJ Report 6 [1975] [hereafter "Western Sahara case"] para. 75-83; John P. Grant & J. Craig Barker, *Encyclopedic Dictionary of International Law* (New York: Oxford University Press, 2009), at "*terra nullius*" definition:

> "The expression "*terra nullius*" was a legal term of art employed in connection with 'occupation' as one of the accepted legal methods of acquiring sovereignty over territory. Occupation' being legally an original means of peacefully acquiring sovereignty over territory otherwise than by cession or succession, it was a cardinal condition of a valid 'occupation' that the territory should be *terra nullius*—a territory belonging to no-one—at the time of the act alleged to constitute the 'occupation' …".

[102] The statement of Prof. Bin Cheng is cited in Fabio Tronchetti, *The Exploitation of Natural Resources of the Moon and other Celestial Bodies; a Proposal for a Legal regime* (The Netherlands: Martinus Nijhoff Publishers, 2009), at 11.

[103] Manfred Lachs, *The Law of Outer Space: an Experience in Contemporary Law-Making* (The Netherlands: Martinus Nijhoff Publishers, Reissued for the 50th Anniversary of IISL), at 44; Frans von der Dunk, "The Dark Side of the Moon, The Status of the Moon: Public Concepts and Private Enterprise" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (1997), at 120; interesting is also the statement of the British Under-Secretary of State for the Foreign Office who stated in 1999 that the "non-appropriation" principle entailed in Art. II of the Outer Space Treaty proves that outer space is an area theoretically capable of being appropriated. Otherwise, there would be no reason for the treaty to clarify such nature; see fn. 9 in Antonio Cassesse, *International Law* (New York: Oxford university Press, 2005), at 95.

[104] Gyula Gal, *Space Law* (1969), at 189; Manfred Lachs, *Law of Outer Space* (the Netherlands: Springer, 1972), at 30; the nature of outer space as *communis omnium* can be derived also from the original text of the Outer Space Treaty in its preamble, which states that outer space is in the interest of all countries, as well as in its Art. I where it is provided for that the use of outer space shall be carried "for the benefit and in the interests of all counties"; an opposite opinion has been supported by Marietta Benko who states that outer space cannot be regarded as *res communis omnium* on the grounds that outer space does not qualify the notion *res*; Marietta Benko & Kai-Uwe Schrogl, Eds., *Space Law: Current Problems and Perspectives for Future Regulation* (The Netherlands: Eleven International Publishing, 2005), at 13; Dr. Ernst Fasan, "The Meaning of the Term 'Mankind' in Space Legal Language" (1974) 2 J. Space L. 125, at 128.

term is also derived from Roman law and is attributed to areas that can be equally used by everyone, even though they cannot be occupied by anyone.[105] This characterization seems to adequately fulfill the requirements of both Art. I and II of the Outer Space Treaty that read "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" and "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" respectively.

The concept of areas that qualify the notion *res communis omnium* was first used to describe the high seas.[106] Judge Castro very accurately describes the nature of the high seas as *res communis omnium* in his individual opinion on the case of "fisheries"[107] by stating, "the high seas, *res communis omnium*, is not something that lends itself to ownership; its use is common to everybody, and this applies also to fishing. The sea *unquam fuit a communion separatum*, and unlike land and rivers, there is no reason to divide it up; […]"[108] This concept was adopted in Art. 87 of the UNCLOS[109] and is based on the "freedom of use and exploration" principle that stands

[105] Brownlie, *supra note* 9, at 175.

[106] The nature of the high seas as to be commonly used by the humankind derives from the *travaux préparatoires* of the convention, specifically by the discussions that took place prior to the creation of the *UN Convention on the Law of the Sea*, signed on 10 December 1982, 1833 UNTS 3, 21 ILM 1261 (1982) (entered into force on 16 November 1994) [hereafter "UNCLOS"]; for example the opinion supported during the UN Conference on the Law of the Sea in 1958 according to which the high seas shall remain free (*mare liberum*) for use, exploration and exploitation, *i.e.*, fishing and mineral resources exploitation, to all States; *United Nations Conference on the Law of the Sea, Volume IV*, UN Doc A/CONF.13/C.2/SR.11-15 (1958), at 27; in *re* the respective case of Antarctica, the notion *res communis omnium* cannot be attributed, since territorial claims on the area exist and the area is not free for exploration to all States; Christian Brunner & Alexander Soucek, *Outer Space in Society, Politics and Law* (Germany: Springer [ESPI (European Space Policy Institute)], 2011), at 279; see, for instance Art. IV of the Antarctic Treaty that does not absolutely prohibit territorial sovereignty over the areas of Antarctica: "1. Nothing contained in this treaty shall be interpreted as: (a) a renunciation by any Contracting Party of previously asserted rights or claims of territorial sovereignty in Antarctica"; *Antarctic Treaty*, signed in Washington D.C. on 1 December 1959, 12 UST 794, 402 UNTS 71, 19 ILM 860 (1980) (entered into force on 23 June 1961) [hereafter "Antarctic Treaty"].

[107] *Fisheries Jurisdiction Case* (Great Britain & North Island v. Iceland) [1974], Separate opinion of Judge Castro, at 81.

[108] *Ibid*, separate opinion of Judge de Castro, at 81.

[109] Art. 87 of the UNCLOS: "1. The high seas are open to all States, whether coastal or land-locked. […]"

alike in the Outer Space Treaty.[110] In this respect, a similar notion has been attributed to the use – but not to the nature – of Antarctica: "the regime of *res communis* allows open access for everyone; *i.e.*, anyone is free to explore the area or territory and use it. […]"[111]

Both the high seas and the Antarctica, sharing a common non-sovereign nature, could have been attributed the notion *res communis omnium*; however, the latter is valid only in reference with the high seas.[112] As such has been characterized outer space: The nature of outer space as being "in the common interest of mankind" was accepted even since 1958 in the 1348 (XII) UN Resolution[113] the preamble of which states "Recognizing the common interest of mankind in outer space […]". Indeed, this concept has been followed by major space law scholars[114] and it has prevailed to characterize the nature of outer space.

C. The Respective Status of Outer Space Natural Resources

"The most fundamental of all the rules of law relating to the continental shelf enshrined in Article 2 of the 1958 Geneva Convention[115] […] is an exercise of sovereign rights for the purpose of exploring the seabed and exploiting its natural resources" was stated in the "North Sea

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[110] Art. I of the Outer Space Treaty: "Outer space, […], shall be free for exploration and use by all States […]"; see also, Kunihiko Tatsuzawa, "The regulation of Commercial Space Activities by the non-Governmental Entities in Space Law" (4 June 2015), online: Space Future <http://www.spacefuture.com/archive/the_regulation_of_commercial_space_activities_by_the_non_governmental_entities_in_space_law.shtml>:

> "The U.S. Delegate considered on analogy of the principle of freedom of the seas that 'Man should be free to venture into space on the same basis that he has ventured on the high seas free from any restraints save those imposed by the laws of his own nation and by the rules of international law, including those embodies in the United Nations Charter'".

[111] Christopher Clayton Joyner & Sudhir K. Chopra, Eds., *The Antarctic Legal Regime* (The Netherlands: Martinus Nijhoff, 1988), at 167.
[112] *Ibid*.
[113] GA Res 1348, *supra note* 8.
[114] *Supra note* 104.
[115] 1958 Geneva Conventions on the Law of the Sea, signed in Geneva, on 29 April 1958, 13 UST 2312, 450 UNTS 11 (entered into force on 30 September 1962) [hereafter "Geneva Convention"].

Continental Shelf" cases by the ICJ[116]. Like the resources of the high seas, *i.e.*, the resources of the Deep Seabed of the high seas, the resources detected in celestial bodies enjoy a specific nature that excludes them from general characterizations attributed to celestial bodies and outer space as a whole; both areas have been characterized as areas *res communis omnium*, since both legal regimes that govern them require them to be beyond state sovereignty and at the same time to be commonly used by the humankind.[117]

The nature of space natural resources, *i.e.*, minerals that exist in the celestial bodies, is to be examined both as part of outer space and as a specific area of it. What makes them differ from general notions attributed to outer space is their status as removable resources. They have already been very precisely characterized as the "fruits of outer space".[118] A question arises as to whether the notion *res communis omnium* can be attributed to natural resources in a manner similar to that which was attributed to outer space. Although the Outer Space Treaty does not specifically refer to celestial bodies, it extends to them references to outer space by often using the wording

[116] *North Sea Continental Shelf Cases* (Federal Republic of Germany v. Denmark, Federal Republic of Germany v. Denmark) [1969] ICJ Report 3 [hereafter "Continental Shelf cases"], at para. 9.

[117] Evidential is Art. 11, para. 8 of the Moon Agreement that requires equal sharing of the natural resources exploited in outer space: "An equitable sharing by all States Parties in the benefits derived from those resource […]."; see also, Aldo Cocca, "The Principle of the Common Heritage of Mankind as Applied to Natural Resources from Outer Space and Celestial Bodies", *Proceedings of XVIth colloquium on the law of outer space* (IISL, 1973), at 174; Barbara Ellen Heim, "Exploring the Last Frontiers for Mineral Resources: A Comparison of International Law Regarding the Deep Seabed, Outer Space, and Antarctica" (1990-1991) 23 Vand. J. Transnat'l L. 819, at 822; for the respective nature of the natural resources of the sea see Art. 137 of the UNCLOS which states:

> "1. No State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, […].No such claim or exercise of sovereignty or sovereign rights nor such appropriation shall be recognized.
> 2. All rights in the resources of the Area are vested in mankind as a whole, on whose behalf the Authority shall act. […]."

[118] Ezra J. Reinstein, "Owning Outer Space" (1999) 20 Northwestern J. of Int'l L. & Bus. 59, at 73:

> "Current space law ostensibly respects the right to use real property in space and to collect and own its fruits. Historically, this has been known as the usufructary right. But the current law doesn't even provide this right freely; it seems to be limited by several clauses of the Outer Space Treaty (e.g. use "for the benefit...of all countries")."

"including the Moon and other celestial bodies";[119] thus, the use of celestial bodies is "in the benefit of all mankind" and "not subject to national appropriation by means of occupation or by any other means".[120] Nowhere, however, does the Outer Space Treaty expressly recognize such nature of their resources.

In order to cover this *lacuna* we can either observe the respective evolutions in the law of the sea – which seems to be more evolved than space law as it established specific regulatory mechanisms for the exploitation of natural resources – or interpret the provisions of the Outer Space Treaty as part of both *lex spetialis* and the *lex generalis*. Following the first approach, the respective status of the natural resources of the sea has to be examined; according to UNCLOS, the resources of the sea are recognized as exploitable, since the Convention establishes an exploitation mechanism by introducing the "Authority", a body that regulates the exploration and exploitation of these resources.[121] It also recognizes natural resources of the sea as "common heritage of mankind,"[122] a concept that differs from that of *res communis* since the former accepts the exploitation of such areas, while the latter does not.[123] Such nature for the natural resources of outer space is portrayed in the Moon Agreement, in a similar way to that embraced by the law of the sea: Art. 11 of the Moon Agreement states, "the Moon and its natural resources are the common heritage of mankind".[124]

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[119] See for example Art. 1 of the Moon Agreement: "The provisions of this Agreement relating to the Moon shall also apply to other celestial bodies within the solar system […]" and Art. I, II, III, IV of the Outer Space Treaty; Carl Q. Christol, "The Common Heritage of Mankind Provision in the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies" (1980) 14 Int'l L. 429, at 432.

[120] Art. I and II of the Outer Space Treaty.

[121] Section 4 of the UNCLOS.

[122] Preamble of UNCLOS: "[…] the area of the seabed and ocean floor and the subsoil thereof, beyond the limits of national jurisdiction, as well as its resources, are the common heritage of mankind, the exploration and exploitation of which shall be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States" and Art. 136 of the UNCLOS : "The Area and its resources are the common heritage of mankind".

[123] Virgiliu Pop, "Marx on Mars: From *Res Communis* to *Res Communist*" in IISL, *Proceedings of the International Conference on the Law of Outer Space* (France: IISL, 2011), at 23-26.

[124] Art. 11 of the Moon Agreement: "The Moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement, in particular in paragraph 5 of this article."

In the quest to bridge the gap between the Outer Space Treaty and the status of space natural resources, it can be argued that: either by following the law of the sea analogy or by interpreting the treaty in light of the more recent concepts enshrined in the provisions of the Moon Agreement the same conclusions are derived. The second approach can take place in light of Art. 31 para. 2 of VCLT which states that "the context for the purpose of interpretation of a treaty shall comprise, in addition to the text, including its preamble and annexes: (a) Any agreement relating to the treaty which was made between the parties in connection with the conclusion of the treaty; […]". Indeed, the Moon Agreement was created as an elaboration of the Outer Space Treaty and on the basis of its principles, concepts and provisions.[125] Although it is neither signed nor ratified by many and major space-faring nations, it can definitely draw a line as to what the nature of space natural resources shall be, given the respective *vacuum* in the Outer Space Treaty.[126] Hence, outer space natural resources can be characterized as the "common heritage of mankind" and in such a way escape the *res communis* concept either by following the analogy derived from the law of the sea or by interpreting the Outer Space Treaty from a contextual perspective.

D. Outer Space and Celestial Bodies as *Res Extra Commercium* and the Impact on Space Natural Resources

Professor Michael Laver[127] supported in 1986 that:

> "Traditionally, […] the Moon was *res nullius*, though in practice, of course, appropriation of the Moon was long considered infeasible. In contrast, the space between celestial bodies has traditionally been considered as *res extra commercium*

[125] "The Agreement reaffirms and elaborates on many of the provisions of the Outer Space Treaty as applied to the Moon and other celestial bodies, providing that those bodies should be used exclusively for peaceful purposes […]", online: UNOOSA <http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/intromoon-agreement.html>; Ty S. Twibell, "Space Law: Legal Restraints on Commercialization and Development of Outer Space" (1996-1997) 65 UNKC L. Rev. 589, at 593.

[126] Although the Outer Space Treaty regulates outer space in a thorough way, it does not include neither specific reference as to the natural resources of outer space.

[127] Dr. Michael Laver is a Professor of Politics at New York University.

> to be beyond national appropriation. This is because national sovereignty can only be claimed on the basis of reasonable proximity to dry land. While such proximity includes areas of territorial sea and air space, the distances involved are relatively small, and are certainly not measured in anything like light years".[128]

Indeed, the nature of areas characterized as *res communis omnium* simultaneously establishes their nature as *res extra commercium*. The latter refers to areas that cannot constitute the object of commercial activities, since they cannot be appropriated and thus there is no ownership tittle on them to be transferred through commercial activities.[129] The definition of this term exists in close proximity to the meaning of *res communis*. Both derived from Roman law seek to emphasize the consequences of the nature of such areas as beyond sovereignty.[130] However, this is not a term that can be attributed to the nature of outer space, since not all areas of outer space can be characterized equally: as analyzed above, the nature of outer space as a whole differs from that of the natural resources of celestial bodies given that the latter can be considered as "common heritage of mankind". It has been supported that efforts to attribute this concept to outer space on "traditional international law" perceptions are void;[131] "none of these concepts has been incorporated into the text of the Moon Agreement. Their meaning and scope have evolved

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[128] Michael Laver, "Public, Private and Common in Outer Space" (1986) 34 Political Studies 359, at 364.

[129] Rudolph Sohm, *The Institutes: A Textbook of the History and System of the Roman Private Law* (Oxford: Clarendon Press, 1907), at 320; Aaron X. Fellmeth & Maurice Horwitz, *Guide to Latin in International Law* (Oxford: Oxford University Press, 2011), online: Oxford Reference <http://www.oxfordreference.com/view/10.1093/acref/9780195369380.001.0001/acref-9780195369380-e-1822?rskey=fG4S0N&result=1>.

[130] Eric Michael Wilson, *The Savage Republic: De Indis of Hugo Grotius, Republicanism and Dutch Hegemony within the Early Modern World-System (C. 1600-1619)*, (The Netherlands: Martinus Nijhoff Publishers, 2008), at 349-350.

[131] Ram Jakhu & Maria Buzdugan, "Development of the Natural Resources of the Moon and Other Celestial Bodies: Economic and Legal Aspects" (2008) Astropolitics: The Int'l J. of Space Politics and Policy 201, at 230:

> "[…] attempts to understand the meaning of the meaning of the CHM principle, as included in the Moon Agreement, with the use of or by heavy reliance upon, analogies and traditional international law concepts, like *res nullius*, *terra nullius*, *terra communis*, *res communis*, *res extra commercium*, etc., is not only unwarranted, but also prove to be counterproductive."

according to the needs, interests, preferences policies and circumstances of various members of the international community […].”[132]

Hence, no solid legal ground has been established as to the nature of outer space and its potential to welcome commercial activities. Whether characterized as *res extra commercium* or not, its use should not be contrary to the provisions of the outer space treaty, according to which, outer space is beyond sovereignty and its use is in the “common interest of mankind”. As to the case of natural resources of the celestial bodies, they consist of such a specific nature which is proven to be *intra commerium* through examples from the past – *i.e.*, the respective status of the sea-bed natural resources as discussed above.

III. Jurisdiction in Outer Space in Light of its Non-Sovereign Nature

> “Now the first and foremost restriction imposed by international law upon a State is that – failing the existence of a permissive rule to the contrary – it may not exercise its power in any form of another territory of another State. In this sense jurisdiction is certainly territorial; it cannot be exercised by a State outside its territory except by virtue of a permissive rule derived from international custom or from a convention”,

states para. 45 of the Permanent Court of International Justice [hereafter “PCIJ”], in its decision in the “Lotus Case” of 1927.[133] This statement justified the existence of state jurisdiction as non-existing outside the territory of the States unless a source of international law otherwise provides.[134] Indeed, back then, the issue of jurisdiction was regarded as territory-based. In this respect, Professor Shaw, in his effort to schematize that jurisdiction is a manifestation of

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[132] *Ibid*.
[133] *The S. S. Lotus*, PCIJ Judgement (1927), A/10 [hereafter the “Lotus case”].
[134] Carlo Focarelli, *International Law as Social Construct: The Struggle for Global Justice* (United Kingdom: Oxford, 2012), at 282:

> “The Lotus principle is invoked by those who have an interest in permission and is criticized by those who in the same subject-matter prefer a prohibition. […] It is highly debatable that in the past international law left states completely free to behave as they pleased: it either was no law at all or it was law and could only restrict state sovereignty. […].”

sovereignty, taught jurisdiction as being an expression of sovereignty, which leads to the creation of legal relationships.[135] Although sovereignty is the main condition that must preexist in order to establish state jurisdiction, other types of jurisdiction have been recognized and bear high importance for the issue of property rights in outer space. Professor Bin Cheng distinguishes three types of jurisdiction; the traditional type of territorial jurisdiction, the personal jurisdiction, which refers to the nationals under the control of each state and, the *quasi-territorial* jurisdiction.[136] The examination of the latter has been greatly triggered in both space law and the law of the sea scholarship.[137] Both areas beyond sovereignty require the existence of this kind of jurisdiction in order to regulate responsibility issues;[138] the reason for this need lies in the fact that both the high seas and outer space are used by States, although no State can establish sovereignty and thus territorial jurisdiction over them. Professor Bin Cheng specifically mentions:

> "In between territorial jurisdiction and personal jurisdiction stands *quasi-territorial jurisdiction*. This is the sum total of the powers of a State in respect of

[135] Shaw, *supra note* 74, at 645: "Jurisdiction is a vital and indeed central feature of state sovereignty, for it is an exercise of authority which may alter or create or terminate legal relationships and obligations".
[136] Bin Cheng, *Studies in International Space Law* (Oxford: Clarendon Press, 1999), at 135.
[137] See for example; *in re* space law: *supra note* 136; Ogunsola O. Ogunbanwo, *International Law and Outer Space Activities* (The Hague: Martinus Nijhoff, 1975), at xv; Said Mosteshar, Ed., *Research and Invention in Outer Space, Liability and Intellectual property Rights* (the Netherlands: Martinus Nijhoff Publishers, 1995), at 73; Henri Abraham Wassenberg, Tanja Masson-Zwan & Pablo Mendes de Leon, Eds., *Air and Space Law: De Lege Ferenda, Essays in Honour of Henri A. Wassenberg* (The Netherlands: Martinus Nijhoff, 1992), at 252; *in re* the law of the sea: Donald R. Rothwell, Alex G. Oude Elferink, Karen N. Scott &Tim Stephens, *The Oxford Handbook of the Law of the Sea* (United Kingdom: Oxford University Press, 2015), at 289; Erik Jaap Molenaar, *coastal State Jurisdiction Over Vessel-Source Pollution* (the Hague: Kluwer Law International, 1998), at 78; Janet Blake, *International Cultural Heritage Law* (United Kingdom: Oxford University Press, 2015), at 74, amongst others.
[138] For instance, Art. II of the Registration Convention provides that:

> "Where there are two or more launching States in respect of any such space object, they shall jointly determine which one of them shall register the object in accordance with paragraph 1 of this article, bearing in mind the provisions of article VIII of the Treaty on Principles governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, and without prejudice to appropriate agreements concluded or to be concluded among the launching States on jurisdiction and control over the space object and over any personnel thereof",

while similar provisions exist in Art. 139 of the UNCLOS; see also *68/74 Recommendations on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space*, UN Doc A/RES/68/74 (11 December 2013), at 2: "The State, taking into account its obligations as a launching State and as a State responsible for national activities in outer space, should ascertain national jurisdiction over space activities carried out from territory under its jurisdiction and/or control."

> ships, aircraft and space craft […] having its nationality. […] Quasi-territorial jurisdiction differs from personal jurisdiction in that it extends not only to the craft in question but also to all persons and things onboard, including the activities of such persons, whether on board the craft or elsewhere".[139]

Hence, although outer space is beyond State sovereignty, and as such beyond State jurisdiction, the extension of State jurisdiction over objects and persons that exist in it, is possible. Indeed, the control that States have over these objects is a link adequate to create State jurisdiction over them;[140] without, however, implying that their jurisdiction can extend to parts of outer space. Thus, the wording of Art. II of the Outer Space Treaty, which prohibits national appropriation and sovereignty in outer space, does not exclude state jurisdiction over objects and persons existing in it.

A. The Case of Space Objects

Indeed, both space law and the law of the sea conventionally recognize extraterritorial state jurisdiction over objects and persons that exist in the respective areas beyond sovereignty (*i.e.*, outer space and the high seas). Art. VIII of the Outer Space Treaty states "a State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body". Likewise, according to Art. 94 of the Convention on the Law of the Sea "every State shall effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag". Thus, it is apparent, that both space objects as well as vessels can be

[139] Cheng, *supra note* 136.
[140] See art. VI of the Outer Space Treaty and Art. II of the Registration Convention.

recognized under state jurisdiction, an element important for the establishment of state responsibility and the respective attribution of liability.[141]

As noticed, both *leges spetiali* provide for the recognition of state jurisdiction over objects and persons as a result of the control exercised by States over them. What needs to be examined concerning the issue of property rights in outer space, is the extent this expression of jurisdiction can reach and the facets under which it can be considered given that the ownership of space objects is not alienated after space objects reach outer space.[142] In fact, the issue of extraterritorial jurisdiction through the exercise of state control was introduced in the "Nicaragua" case for the examination of state responsibility matters and further refined in the "Tadic" case[143]. "For the United States to be legally responsible, it would in principle have to be proved that that State had effective control of the operations in the course of which the alleged violations were committed"[144] as stated in the former case. The latter case however, leaped a step further by adding that the element of "overall control going beyond the mere financing and equipping" of activities is required for the establishment of jurisdiction. Both cases attempted to justify the exercise of state control as amounting to jurisdiction over situations, objects and persons in order to establish state responsibility. However, none of them argued that such a *de facto* jurisdiction can lead to anything more than control (*i.e.*, to sovereignty), or that it can transform jurisdiction to sovereignty.[145] Thus, when the discussion comes to property rights in areas beyond sovereignty and jurisdiction, such control and extraterritorial jurisdiction cannot lead to its transfer to other types of legal controls

[141] Mansell, J.N.K., *Flag State Responsibility, Historical Development and Contemporary Issues* (The Netherlands: Springer, 2009), at 13.
[142] Kelly Zullo, "The Need to Clarify the Status of Property Rights in International Space Law" (2001-2002) 90 Geo. L. J. 2413, at 2430.
[143] *Prosecutor V. Tadic case* International Criminal Tribunal for the Former Yugoslavia [hereafter "ICTY"] Case No IT-94-1-A [1999] [hereafter "Tadic case"].
[144] Nicaragua case, *supra note* 88, at para. 115.
[145] Tadic case, *supra note* 144, at para. 1546.

such as sovereignty or ownership. Hence, even if space objects under specific State jurisdiction exist in areas of outer space, they will always remain beyond jurisdiction and thus beyond any kind of legal controls.

B. The Case of Celestial Bodies and their Natural Resources

As stated above celestial bodies are considered to be a part of outer space and, according to the provisions of Art. II of the Outer Space Treaty they remain as areas beyond national appropriation and sovereignty in the same way as outer space as a whole. Additionally, according to the applicability of jurisdictional concepts in outer space that regard outer space being also beyond State jurisdiction, celestial bodies enjoy this independence as well. However, two are the main issues that arise as to celestial bodies in conjunction with property rights on them. It is true that modern commercial activities, such as space mining and space tourism, require the establishment of permanent installations on celestial bodies for the facilitation of their activities.[146] Thus; "what is the status of these installations and how can it influence the status of celestial bodies?" would be the first question to battle. The second question would revolve around the exploitation of natural resources of celestial bodies and the jurisdiction of States and private entities over them.

In reference to the first question, it can be stated that permanent installations qualify as space objects and thus are under State jurisdiction. Their nature as space objects is established on grounds of Art. I of the Liability Convention from which a general definition of what a space object

[146] Kopal, *supra note* 20, John Sparkling, at 186: "Article XII, for example, contemplates that a state may have installations, equipment and space vehicles on celestial bodies, which is consistent with the type of infrastructure that could be used in mining"; such installation demands the clarification of the scenery as to property rights on the areas where installation takes place, see, Martin Menter, "Commercial Space Activities Under the Moon Treaty" (1979) 7 Syracuse J. of Int'l L. and Commerce 213, at 214, 215.

derives.[147] "Is it possible, however, this jurisdiction to be prolonged in order to occupy the surface of the celestial body whereon the installment takes place?" It is not possible since neither of the five UN space law treaties provide for the ground for such argument, nor an analogy from the law of the sea could lead to such conclusion; indeed, "[…] it is quiet questionable whether such a basic legal rule which applies the flag-state principle and thus effectively prolongs state jurisdiction over space objects and celestial bodies, can solve any further conflict in the case of a permanent settlement on celestial bodies".[148] Jurisdiction over permanent installations on celestial bodies does not lead to jurisdiction over the celestial body itself in a manner identical to the case of the geostationary synchronous orbit where state jurisdiction over satellites does not lead to jurisdiction over and/or ownership of the respective parts of outer space.[149] Indeed, Art. II of the Registration Convention, the only international instrument specifically referring to jurisdiction over space objects, requires the maintenance of jurisdiction over objects launched into outer space without foreseeing the extension of such jurisdiction over the surface of the celestial body itself.[150]

As to the second question, concerning jurisdiction over natural resources of celestial bodies the answer is ambiguous and will be examined in details in the chapter that follows. As noted

[147] "(f) The term "space object" includes component parts of a space object as well as its launch vehicle and parts thereof"; so far there is no agreed definition of what qualifies as space object. However, it is generally accepted the broad definition that as space object qualify objects launched from the Earth to outer space, as well as parts of it; see, for instance, *Summary of information on national practices and legislation of States with regard to the definition and delimitation of outer space*, UN-COPUOS, Legal Subcommittee, 52nd Sess, UN Doc A/AC.105/C.2/2013/CRP.8 (2013), at 3; *Contribution of Belgium to the Work of the Working Group on Agenda Item 8 (a) entitled "Matters relating to the Definition and Delimitation of Outer Space"*, UN-COPUOS, Legal Subcommittee, 45th Session, UN Doc A/AC.105/C.2/2006/CRP. 8 (2006), at 2; *Questionnaire on possible legal issues with regard to aerospace objects: replies received from member States*, UN-COPUOS, UN Doc A/AC.105/635/Add.11 (2005), at 4; *National legislation and practice relating to definition and delimitation of outer space*, COPUOS, UN Doc. A/AC.105/865/Add.1 (2006), at 3; hence, installations established on parts of celestial bodies qualify as such, given their launching – either partial or overall – from Earth to outer space; J. Henry Glazer, "Domicile and Industry in Outer Space" 17 Colum. J. Transnat'l L. 67, at 73.

[148] Gabriel Lafferranderie, Daphne Crowther, Eds., *Outlook on Space Law Over the Next 30 Years: Essays Published for the 30th Anniversary of the Outer Space Treaty* (The Netherlands: Kluwer Law International, 1997), at 139.

[149] See the reaction of the international community to the opposite arguments supported by the equatorial States in the case of the Bogota Declaration, *supra note* 95; Susan Cahill, "Give Me My Space: Implications for Permitting National Appropriation of the Geostationary Orbit" (2000-2001) 19 Wis. Int'l L.J. 231, at 241.

[150] Registration Convention, *supra note* 138.

above, jurisdiction is a manifestation of sovereignty.[151] Under Art. II of the Outer Space Treaty celestial bodies are not subject to national sovereignty in the same way as outer space *per se*. This could go against the existence of jurisdiction over outer space natural resources as them being part of the celestial bodies. However, ownership is more than a mere concept of effective control as it requires the existence of title over the object.[152] Hence, if we accept that natural resources can be appropriated and thus owned by private entities, jurisdiction over them would then be feasible, reaffirming the state of ownership while the reverse could not be validly stated.

IV. Conclusions

Having analyzed the legal status of outer space and of celestial bodies, the examination of the specific issue *in re* private ownership of celestial bodies can follow based on the outcomes of the present chapter. Indeed, the non-sovereign nature of outer space, the use of which is demanded to be at the same time "in the interest of all States", requires special legal treatment and interpretation as to the provisions of space law that regulate the issue of ownership acquisition. Sovereignty and jurisdiction, two notions that have been tackled in any kind of terrestrial area, constitute a fragile issue for extraterrestrial zones as well. Thus, what remains to be examined is the way in which their application to outer space can influence the potential of property in outer space, and specifically on celestial bodies.

Sovereignty, jurisdiction and appropriation, different facets of almost the same concepts, all dealing with the use of outer space, seem to occasionally dangerously approach each other, while at other times distinctively remain apart. "Where do they coincide?" "How do they differ?", "In which way can they be applied excluding one the application of another?" and, "How can these

[151] Shaw, *supra note* 135.
[152] Sparkling, *supra note* 146, at 236.

controls facilitate – or prevent – private entities from acquiring property on celestial bodies?" are questions that build the scope and purpose of the chapter that follows.

Chapter III: Private Ownership of Celestial Bodies
From Science Fiction to Reality

"Humanity has the stars in its future, and that future is too important to be lost under the burden of juvenile folly and ignorant superstition."[153]

I. Introduction

This chapter follows as a consequence of the legal status of outer space and the celestial bodies. Their status – as examined in the second chapter of this thesis – is governed by a non-sovereign nature and by principles demanding its common use by all States in the benefit of humankind. However, this is one side of the coin. The other side divulges the modernization of space activities that serve the facilitation of terrestrial life and require legal steps toward commercial private activities that necessitate the establishment of ownership on parts of celestial bodies. The purpose of this chapter therefore is, to strike a balance between the following two counter powers: the traditional principles and concepts of space law and the modern uses of outer space in light of a modernized interpretation of *corpus juris spatialis*.

II. The Necessity of Private Participation in the Exploitation of Celestial Bodies

As illustrated in the first chapter of this thesis, it is clear that Outer space, and especially celestial bodies, house valuable mineral resources that can be used to facilitate both terrestrial and extraterrestrial needs.[154] The involvement of various public and private space actors in such exploitation is required, emphasis given on the private side.[155] Although major governmental

[153] Isaac Asimov.
[154] *Ibid*. Ch. I, Par. II, Sec. A.
[155] For example, "NASA—building on successful partnerships with private companies to resupply the International Space Station—is now looking to private entrepreneurs to help exploit resources on the moon". "NASA bets on private companies to exploit moon's resources" (9 February 2014), online: NASA <http://phys.org/news/2014-02-nasa-private-companies-exploit-moon.html>; see also, Tronchetti *supra note* 102, at 194: "The possibilities to explore and use outer *space* for commercial purposes have raised ... a key element in stimulating *participation* and involvement

entities have expressed their interest in promoting such activities,[156] the private sector seems to be more actively involved in relevant investment plans.[157] Moreover, the significance of private participation in such activities can also be grounded on the fact that States involved in such activities often seek cooperation with private entities.[158] Indeed, in November 2014, NASA signed two contracts with private companies[159] for the realization of space natural resources exploitation activities.[160] The purpose of the contracts is the mining of Near Earth Asteroids by private companies; the extracted minerals are aimed to be used by NASA in order to supply its space missions.[161] Yet, ESA is supportive of private participation in this respect: "As part of its new strategy for space exploration, ESA is looking for commercial partners to share the adventure and benefits of leaving Earth,"[162] while it also clearly states that "private-sector partners are welcome to join ESA in its space exploration strategy".[163]

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of *space*-faring nations and *private* companies in the *exploitation* of extraterrestrial *resources*"; Lawrence L. Risley, "An Examination of the Need to Amend Space Law to Protect the Private Explorer in Outer Space" (1999) 26 W. St. U. L. Rev. 47, at 64-65.

[156] "These robotic missions are a critical step in preparing humans to visit asteroids where we will learn about the valuable resources available in space, and further develop ways to use them in our quest for more efficient and affordable exploration". "Beyond Earth; Expanding Human Presence into the Solar System", online: NASA <https://www.nasa.gov/exploration/whyweexplore/why_we_explore_main.html#.VZqBPEbv40w> .

[157] *Supra note* 4.

[158] Roger K. Hoover, "Law and Security in Outer Space from the Viewpoint of Private Industry" (1983) 11 J. Space L. 115, at 116-117.

[159] "NASA today awarded two contracts to Deep Space Industries Inc. to accelerate the agency's plans to partner with private industry on asteroid prospecting and harvesting". "NASA Selects Deep Space for Two Asteroid Contracts" (19 June 2015), online: Deep Space Industries <http://deepspaceindustries.com/nasa-selects-deep-space-for-two-asteroid-contracts/>; similar contract has also been signed between NASA and Planetary Resources Inc., see, "Nano Racks-Planetary Resources-Arkyd-3" (18 June 2015), online: NASA <https://www.nasa.gov/mission_pages/station/research/experiments/1718.html>.

[160] "DSI will provide the technical resources, capabilities and system integration required to discover, harvest, process and market in-space resources". "Deep Space Industries", online: NASA <http://www.nasa.gov/centers/ames/researchpark/partners/space/dsi/#.VZqFFUbv40w>.

[161] NASA, *Public-Private Partnerships for Space Capability Development; Driving Economic Growth and NASA's Mission* (NASA, April 2014), at 2, 3, online: NASA <https://www.nasa.gov/sites/default/files/files/NASA_Partnership_Report_LR_20140429.pdf>.

[162] "Calling New Partners for Exploring the Moon and Mars" (13 March 2015), online: ESA <http://www.esa.int/Our_Activities/Human_Spaceflight/Calling_new_partners_for_exploring_the_Moon_and_Mars>.

[163] *Ibid.*

That said, the need for private participation in suchlike activities of space exploitation is apparent, while private initiatives have already taken place as independent from national plans of space agencies; for instance, the Shackleton Energy Company[164] aims to extract ice from celestial bodies by already designing the route of the mission and by preparing the technology to be used.[165] The company also plans on constructing a pipeline to connect the Moon to the Earth in order to easily transport harvested iced water; "We need to build infrastructure from Earth all the way to the Moon to ensure a chain that fuels the frontier," specifically states the company.[166]

Both private activities that are supported or incentivized by states, and entirely independent private initiatives seek the same result: the exploitation of celestial bodies *via* the extraction of valuable minerals, activity that requires the acquisition of property rights on the extracted materials for its practical efficiency (*i.e.*, for the feasibility of the commercial exploitation of the minerals).[167] Hence the crucial need to examine the concept of property in its traditional form and its potential to be attributed to outer space, as a place beyond sovereignty, and jurisdiction.

III. The Concept of Property

A. General Considerations

"The concept of property is an ancient one, and far from being of a size or shape incapable of entering the human mind, it was actually formed there".[168] Many characterizations have been given

[164] *Supra note*. 4.
[165] Mike Wall, "Moon Mining Idea Digs up Lunar Legal Issues" (13 January 2011), online: Space.com <http://www.space.com/10621-moon-mining-legal-issues.html>.
[166] "Program", online: Shackleton <http://www.shackletonenergy.com/program/#program1>.
[167] Board of Directors of the International Institute of Space Law [hereafter IISL], "Claims to Property Rights Regarding the Moon and other Celestial Bodies", online: IISL <http://www.iislweb.org/docs/IISL_Outer_Space_Treaty_Statement.pdf>.
[168] Ezra Bowen, "Concept of Private Property" (1925) 11 Cornell L. Rev. 41, at 41.

to describe the relationship that links a person to an object rendering the former owning the latter. "Ownership", "possession", "property" are some of them, all of which vest the same rationale; the right of the owner to exclude others from using the object of his "ownership", "possession" or "property".[169] Originating from Roman law, the notion of property was perceived as referring to the rights and controls of a person over an object that amount to *dominium* and *proprietas* over the object excluding others from using it.[170] The concept of property has been also considered as such in both common and civil law jurisdictions. According to Bouvier, the concept of property as perceived by the law of the United States is "the right and interest which a man has in lands and chattels to the exclusion of the others",[171] while English national law recognizes property as the absolute title that a person has on a land[172] that entitles him to exclude others from the land's use; title that is multi-dimensional and extends to (1) the surface of the owned land, the constructions that exist on it (2) and the subsurface (3).[173] In a similar way, civil law jurisdictions recognize ownership as the rights of a person over an object that entitle him to possess, use and defend his aforementioned rights against others.[174] It is thus overt that the concept of property is congenial in

[169] "Ownership implies not merely that the owner has certain rights to P but that the owner is the only one who has these rights with regard to P. Property rights are in some sense exclusive", see, Frank Snare, "The Concept of Property" (1972) 9 American Philosophical Quarterly 200, at 203.

[170] William L. Burdick, *The Principles of Roman Law and their Relation to Modern Law* (Clark, New Jersey: The Lawbook Exchange, Ltd, 2004), at 325, where it is stated that "*Domimiun* is thus what the later commentators called a "real" right," that is, a right maintainable against all other persons."

[171] John Bouvier, Francis Rawle, *A Law Dictionary; Adapted to the Constitution and Laws of the United States of America and of the Liberal States of the American Union: with references to the civil and other systems of foreign law, Vol II* (Philadelphia: J. B. Lippincott Company, 1891), at 478.

[172] See *U.K. Land Registration Act of 2002*, Part 2, Chapter 1, Section 11, online: UK Government <http://www.legislation.gov.uk/ukpga/2002/9/section/11>.

[173] See mining principles of English common law, Nicholas J. Campbell, "Principles of Mineral Ownership in the Civil Law and Common Law Systems" (1956-1957) 31 Tul. L. Rev. 303, at 304.

[174] For example see para. 903 of the German Civil Code (Bürgerliches Gesetzbuch) [BGB], (18 August 1896) that reads: "The owner of a thing may, […] exclude others from every influence"; Boudewijn Bouckaert, *Property Law and Economics* (USA: Edward Elgar Publishing, 2010), at 26; see also Book II, Art. of the French Civil Code (Code Napoleon, enacted by Napoléon I in 1804), where the right on ownership is described as "the right to enjoy and dispose of a thing in the most absolute manner provided it is not used in a ways prohibited by statutes or regulations"; John G. Sprankling, *The International Law of Property* (United Kingdom: Oxford University Press, 2014), at 296.

various jurisdictions and consists in the right of the owner to exclude others from using the object of his ownership. As a result, property accedes to entail the notions of ownership and possession.

Besides common and civil national laws, the concept of ownership has also been recognized in international law; Art. 17 of the Universal Declaration of Human Rights [hereafter "UDHR"] recognizes both the concept of property and the owner's right to enjoy it undisturbed, by stating that "everyone has the right to own property alone as well as in association with others" and that "no one shall be arbitrarily deprived his property".[175] In a coherent way, the absolute nature of property over objects is recognized in Art. 1 of the 1st Protocol to the European Convention on Human Rights [hereafter "ECHR"], which protects the meaning of property under the notion of possession and reads: "Every natural or legal person is entitled to the peaceful enjoyment of his possessions".[176]

Having exposed the way in which the notion of property is perceived and treated by national jurisdictions and classic fields of international law (*i.e.* human rights law), the question arises as to how similarly or how inversely this concept can be attributed to areas governed by principles of space law such as the non-sovereign and non-appropriable nature of outer space. The major element on which the concept of property is centered is the right of the owner to exclude others from using his property. Accordingly, the question becomes: "Is it possible to transfer this concept to outer space by considering that the subject of outer space is humankind?"[177] The question becomes especially interesting by taking into account Art. II of the Outer Space Treaty,

[175] *The Universal Declaration of Human Rights*, adopted by the UN Commission on Human Rights in 1948, online: UN <http://www.un.org/en/documents/udhr/index.shtml>.
[176] *1st Protocol to the European Convention for the Protection of Human Rights and Fundamental Freedoms*, signed in Paris, on 20 March 1952, ETS 9 (entered into force 18 May 1954) online: ECHR <http://www.echr.coe.int/Documents/Convention_ENG.pdf>.
[177] Art. I of the Outer Space Treaty: "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, […], and shall be the province of all mankind."

which expressly prohibits appropriation of outer space and its parts,[178] and the fact that the Moon Agreement introduces the concept of "common heritage of mankind" to characterize the nature of outer space natural resources.[179] In order to answer these questions the examination of the legal powers deriving from the concept of property is necessary.

B. *Usus, Fructus, Abusus*

The factual consequences of property are concentrated in three fundamental elements also derived from Roman law: the *usus*, the *fructus* and the *abusus*;[180] the term *usus* refers to the right to use the object of the ownership itself; *fructus* is the right of the owner to enjoy the benefits of object, and; *abusus* is the right of the owner to freely dispose the object of the ownership at his will.[181]

All the above elements compose the notion of property and constitute the various facets it can be vested. These aspects of ownership are respected in almost every civil and common law systems in order to shape the meaning of property.[182] The feasibility of transferring such notions to a

[178] Art. II of the Outer Space Treaty: "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."
[179] Art. 11 para. 1 of the Moon Agreement: "The Moon and its natural resources are the common heritage of mankind".
[180] See footnote 1 in A. N. Yiannopoulos, "Usufruct: General principles Louisiana and Comparative Law" (1966-1967) 27 La. L. Rev. 369, at 369; the same meaning has the notion of property for international law: "At international law, "property" consists of a bundle of rights including the right to use, the right to enjoy and the right to destroy or dispose the property (*i.e., usus, fructus, abusus*)", see, D. M. McRae, A. L. C. de Mestral (Eds.), *The Canadian Yearbook of International Law, Vol XLVII* (Vancouver: University of British Columbia Press, 2010), at 440.
[181] "Since Roman times, rights of ownership have been acknowledged to include such diverse elements as *usus*, or rights of use; *fructus*, or rights to enjoy and appropriate the fruits of use; and *abusus*, or rights of abuse, which include the rights to liquidate, sell, give away, or otherwise "alienate" the property", see, Raymond Russell, *Sharing Ownership in the Workplace* (New York: State University of New York Press, Albany, 1985), at 2.
[182] As described in the section devoted to the concept of property, both common law and civil law codes acknowledge this concept in a similar way. The same happens when it comes to the definition of its three sub-elements. Indeed, "although lawyers may use different terminology to describe property's attributes, the common law rights to use, exploit and dispose of property are consonant with the civil law's focus on *usus*, *fructus* and *abusus*"; see, Leon Trakman, Nicola Ranieri, *Regionalism in International Investment Law* (New York: Oxford University Press, 2013), at 443.

potential ownership in outer space is to be examined in the effort to define how the notion of property can be perceived – in case it can – in space law.

As mentioned above, Art. II of the Outer Space Treaty requires that outer space is not subject to national appropriation, while Art. I of the same treaty argues that "the exploration and use of outer space shall be carried out for the interests and in the benefit of all countries." Although the notion of appropriation is mentioned as non-applicable in outer space, the issue has to be studied by separately examining the three elements encompassed in the classic concept of property.

In regards the first element, the *usus*, it is expressly allowed in Art. II of the Outer Space Treaty.[183] Although there is a precondition of the use (*i.e.*, the use to be in the interest and for the benefit of all states), it is at any rate foreseen. Thus, the question amounts to asking what type of use is allowed to take place in outer space and how broadly this term can be interpreted as to what it includes. According to Bin Cheng and Bourély the term "use", as accustomed in the Outer Space Treaty includes the notion of exploitation.[184] This view is justified on the basis of the practice followed by the United Nations in the years that followed the adoption of the UN Space Law Treaties: The General Assembly has, according to Bin Cheng, adopted Resolutions that regulate some aspects of the "use" of outer space: the 37/92 Resolution of 1982 that refers to the use of outer space for direct broadcasting purposes through artificial satellites and the 41/65 Resolution on direct broadcasting.[185] However, there is neither UN Resolution until now, nor other

[183] Art. II of the Outer Space Treaty: "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"

[184] Bin Cheng, "The Commercial Development of Space: the Need for New Treaties" 19 (1991) J. Space L. 17, at 17, see his footnote 2 (Bourély, "La commercialisation des activités spatiales: aspects juridiques" (1989) 37 *Annales de l' Univestité des Sciences Sociales de Toulouse* 43, at 53:

> "The term "use" is here used in its broad meaning to include "exploitation", although theoretically it is possible, as the Moon Treaty has perhaps done, to distinguish between exploration, use and exploitation."

[185] Cheng, *supra note* 184, at 18.

international legal instruments to define the term "use" in relation commercial activities on celestial bodies, or in outer space as a whole.[186] Hence, the interpretation that can be given to the term in light of the above activities will be restricted by the special characteristics attributed to the term in the *lex spetialis*.

Moving on to the second and third elements of the concept of property, the *fructus* and the *abusus*, the silence of the Outer Space Treaty is apparent, since no specific mention is made to these terms. As discussed earlier, the term *fructus* is used to describe the enjoyment of benefits that the existence of property on an object grants. The use of outer space "shall be carried out for the benefit and in the interests of all countries" reads Art. I of the Outer Space Treaty, whereas Art. 4 of the Moon Agreement considers the use of outer space and the celestial bodies as being "the province of all mankind" and as being "carried out for the benefit and in the interests of all countries". Thereby, the *fructus* of outer space is not prohibited although restricted by a sharing of benefits. Given the above, the concept of property in outer space is legally feasible, though limited. Hence, what remains is the examination of whether the third element of the concept of property, the *abusus*, can characterize the use of outer space; a major issue in light of the commercial exploitation of the natural resources of celestial bodies: "Can they be disposed by the extracting entities?" and if so, "What is the place and interpretation of the "non-appropriation" principle?"

As apparent, the possible existence of the concept of property on parts of outer space cannot be satisfied unless its three sub-elements efficiently coexist. The study of the "non-appropriation" principle as enshrined in Art. II of the Outer Space Treaty can now take place in light of the traditional concept of property, as analyzed above.

[186] *Supra note* 10.

IV. The "Non-Appropriation" Principle

Whilst the airspace that exists above the territory of the States is regulated as being under the sovereignty of the respective States,[187] the contrary is encompassed in the *corpus juris* of international space law.[188] Article 2 of the Outer Space Treaty reads "Outer Space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means". These so called "non-sovereignty" and "non-appropriation" principles have formed the subject of many academic discussions;[189] the "non-appropriation" principle has even been characterized as "under assault" due to the critic it receives according to which it bars commercial uses of outer space.[190] The nature of this principle has to be examined from two different perspectives; first, the historical context of the creation of the treaty has to be taken into account coupled with its nature as reflecting customary law, [191] and; second, the principle has to be examined from an up-to-date and functional perspective taking into account the need to commercialize outer space activities and the respective role of private space actors as displayed above.

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[187] Art. 1of the Chicago Convention: "Every state has complete and exclusive sovereignty over airspace above its territory."

[188] The introduction of the "non-appropriation" principle in space law took place in the *International co-operation in the peaceful uses of outer* space, GA Res 1721, UNGAOR, 16th Sess, Un Doc A/Res/1721 (1961) that states: "Outer Space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation."

[189] See for example the IISL Statement of the Board of Directors in 2004; H. A. Wassenberg, *Principles of Outer Space in the Hindsight* (The Netherlands: Kluwer Academic Publishers, 1991), at 45; Kermit L. Hall, *The Oxford Companion to American Law* (New York: Oxford University press, 2002), at 758; Bin Cheng, "Outer Space: The International Legal Framework. The International Legal Status of Outer Space, Space Objects and Spacemen in Air and Outer Space Law" (1981) 10 Thesaurus Acroasium, at 63.

[190] See opinion of Dr. Leslie Tennen in IISL/ECSL Space Law Symposium 2004, Tanja Masson-Zwaan, "IISL/ECSL Space Law Symposium 2004: 'New Developments and the Legal Framework covering the Exploitation of the Resources of the Moon'", online: IISL <http://www.iislweb.org/docs/2004_IISL-ECSL-report.pdf>; Fabio Tronchetti, "The "non-appropriation" Principle Under Attack: Using Article II of the Outer Space Treaty in its Defence", IAC-07-E6.5.13, at 2-3.

[191] Fabio Tronchetti, "the Non–Appropriation Principle as a Structural Norm of International Law: A New Way of Interpreting Article II of the Outer Space Treaty" (2008) 33 Air and Space Law 277, at 285.

A. The "Non-Appropriation" Principle in the Outer Space Treaty; the Lack of a Comprehensive Interpretation

The creation of the Outer Space Treaty followed a period during which the first attempts to reach and explore outer space and celestial bodies took place.[192] However, the nature of these activities was not commercial in character.[193] The launch of Sputnik I into orbit in October 1957 constituted the first attempt;[194] being a solely explorative mission, it did not cause major space-faring nations to seek the establishment neither of sovereignty, nor of private ownership in the *corpus juris spatialis*.[195]

> "As a 10-year old child, I watched this momentous event on our black-and-white television set. […]. One of the commentators noted that when American flag was placed on the moon that did not indicate that the United States was claiming sovereignty over the moon."[196]

Indeed, the drafting of the Outer Space Treaty followed a series of UN Resolutions all of which considered outer space as beyond sovereignty and appropriation of States.[197] At this point

[192] For example, the Sputnik I mission took place in 1957, the mission of Vostok I with Yuri Gagarin onboard in 1961, and the Apollo 11 landing on the Moon in 1969 just after the establishment of the treaty; see, Stephen E. Doyle, "A Concise History of Space Law: 1910-2009" in IISL [Mark Sundhal, V. Gopalakrishnan (Eds.)], *New Perspectives on Space Law, the Proceedings of the 53rd Colloquium on the Law of Outer Space*, Young Scholar Session (France: IISL, 2011), at 1.
[193] S. E. Doyle, "Concepts of Space Law before Sputnik" in IISL, *Proceedings of the fortieth colloquium on the law of outer space* (Italy: American Institute of Aeronautics and Astronautics, 1997), at 3.
[194] Sputnik I was the first artificial satellite and it was launched by the Soviet Union on 4 October 1957; see, "Sputnik and the Dawn of the Space Age", online: NASA <http://history.nasa.gov/sputnik/>.
[195] Interpretation of Art. II of the Outer Space Treaty by Stephen Freeland and Ram Jakhu in Stephen Hobe, Bernard Schmidt-Tedd, Kai-Uwe Schrogl (Eds.), *Cologne Commentary on Space Law, Volume I* (Germany: Carl Heymanns Verlag, 2009), at 47.
[196] Statement by Arend in 2009, an American professor at Georgetown University, cited in Kathryn Milun, *The Political Uncommons: the Cross-cultutal Logic of the Global Commons* (England, USA: Ashgate, 2011), at 147.
[197] *Supra note* 10.

of time, outer space was considered to embody the concept of *res communis omnium*, as analyzed in the previous chapter.[198]

Even the placement of the American flag on the surface of the Moon after the launch of Apollo 11 did not find any serious components in the international community.[199] Derived is thus the conclusion that the establishment of a "non-appropriation" and "non-sovereignty" principle to govern outer space was a common sense scenario. Indeed, this concept was transformed into principle in 1966 when the 2222 UN Resolution[200] unanimously[201] characterized outer space as being beyond sovereignty and appropriation by introducing Article II of the Outer Space Treaty as it reads today.[202]

Therefore, it is clear, that the establishment of the "non-appropriation" principle was not an arbitrary initiative in favor of solely a few nations.[203] It was embodied into law concepts already

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[198] *Ibid*.: "Outer Space and Celestial Bodies as areas beyond Sovereignty" in Chapter I.

[199] Freeland, *supra note* 195, at 47:

> "Indeed, by the time that the Outer Space Treaty was finalized, both major space powers of the time, the United States and the Soviet Union, had already been engaged in an extensive range of space activities; yet neither had made a claim to sovereignty over any part of outer space, including celestial bodies, notwithstanding the planting by the Apollo 11 astronauts of an American flag on the surface of the moon. As a result, although it was of great importance to formalize this principle of "non-appropriation" of outer space, the drafting process leading to the finalization of Article II of the Outer Space Treaty was relatively uncontroversial, particularly given its early acceptance as a fundamental concept by these two space faring States."

[200] *Treaty on principles governing the activities of states in the exploration and use of outer space, including the moon and other celestial bodies*, GA Res 2222, UNGAOR, 21st Sess, UN Doc, A/Res/2222 (1966).

[201] "The General Assembly unanimously adopted a Resolution on October 17, 1963, welcoming the Soviet and U.S. statements and calling upon all States to refrain from introducing weapons of mass destruction into outer space", see, U.S. Department of State, Bureau of Arms Control, Verification, and Compliance, "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Narrative", online: U.S. Department of State <http://www.state.gov/t/isn/5181.htm>; see also the draft proposal of Italy for questions on the definition of outer space and its utilization: "*Recalling* that the General Assembly unanimously adopted Resolution 2222 (XXI), to which …", Rene H. Mankiewicz, *Yearbook of Air and Space Law 1966* (Montreal: Institute of Air and Space Law, McGill University, 1970), at 395.

[202] Art. II of the Outer Space Treaty: "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."

[203] Fabio Tronchetti, "The "non-appropriation" Principle as a Structural Norm of International Law: A New Way of Interpreting Article II of the Outer Space Treaty" (2008) 33 Air & Space L. 277, at 297:

> "In June 1966, both the United States and the Soviet Union submitted to the United Nations Committee of the Peaceful Uses of Outer Space (UNCOPUOS) drafts of an instrument that would

existing through state practice and which were regarded binding upon all States.[204] Hence, the two elements of custom, the state practice and the *opinio juris*, as laid down in the theory and jurisprudence of international law,[205] are fulfilled, and the "non-appropriation" principle is proved to reflect customary law as well.[206] Logical consequence is a dual binding nature of the provisions of Article II of the Outer Space Treaty not only as a part of the conventional body of space law, but also as of a customary nature.[207] Therefore, not only States-party to the Outer Space Treaty are

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> become the Outer Space Treaty. These drafts were based on the non-appropriative nature of outer space. In 1967, the non-appropriative nature of outer space was formally laid down in Article II of the Outer Space Treaty."

[204] Bin Cheng, "United Nations Resolutions on Outer Space: "Instant" International Customary Law?" (1965) 5 Indian J. Int'l L., at 23; see also, citation of fn. 13 in Diego German Mejia-Lemos "Some Considerations Regarding "'Instant' International Customary Law', fifty years later" (2015) The Indian Soc. of Int'l L., at 4: "Cheng had concluded that the ''principle of "non-appropriation" of celestial bodies enunciated in Resolutions 1721A and 1962 may [in time], if adhered to and upheld by members of the United Nations, including both super-powers, become a rule of international customary law'"".

[205] See, Antony Aust, Handbook of International Law (Cambridge: Cambridge University Press, 2010), at 6:

> "In international law, a rule of custom evolves from the practice of States, and this can take a considerable or a short time. There must first be evidence of substantial uniformity of practice by a substantial number of States. In 1974, the ICJ found that a rule of custom (now superseded) that States had the exclusive right to fish within their own 12 nautical mile zone had emerged. State practice can be expressed in various ways, such as governmental actions in relation to other States, legislation, diplomatic notes, ministerial and other official statements, government manuals (as on the law of armed conflict), certain unanimous or consensus Resolutions of the UN General Assembly and, increasingly, in soft-law instruments . The first such Resolution was probably Resolution 95(I) of 11 December 1946 which affirmed unanimously the principles of international law recognized by the Charter of the Nuremberg International Military Tribunal and its judgment."

[206] It is also to note that the evolution of this principle as of a customary nature took place in a way similar to the one in which the respective principle that is attributed to the high seas was developed, see, Academie de Droit International, *Collected Courses V* (The Netherlands: Kluwer Academic Publishers Group, 1982), at 115: "Perhaps an argument could be made today that continued "non-appropriation" of the deep sea-bed by States is "practice accepted as law", […]. Its legal force is predicted on a general consensus that a new legal regime should be adopted to meet the requirement of sea-bed mining."

[207] The "non-appropriation" principle has also been presented as embodying *jus cogens* and thus as constituting a peremptory rule of international law. This has arguably been supported by scholarship that acknowledges the whole Outer Space Treaty as reflecting *jus cogens* and thus norms that are insurmountable; see, for example, Carl Q. Christol, "Judge Manfred Lachs and the Principle of Jus Cogens" (1994) 22 J. Space L. 33, at 42:

> "Writing in 1965 C.W. Jenks treated *jus cogens* as having a foundation in international public policy. Applying this premise to outer space activities, he concluded that "the prohibition of appropriation [of outer space and celestial bodies] rests essentially on grounds of international public policy"";

see also, Ricky Lee, *Law and Regulation of Commercial Mining of Minerals in Outer Space* (Dordrecht: Springer, 2012), at 127:

bound to respect this principle but also States that have not signed, nor ratified the treaty.[208] The subsequent question to be raised and answered consists in the content and ambit of this principle.

One of the major factors that triggered the academic community in answering this question is linked to the wording "national appropriation by claim of sovereignty" met in Art. II of the Outer Space Treaty.[209] Two schools of thought have attempted an interpretation. The interpretation followed by the first approach takes place in a systemic way by combining Art. II to Art. VI of the Outer Space Treaty:[210] Art VI of the Outer Space Treaty introduces state-oriented responsibility regime to space law. This regime requires State control and supervision over space activities undertaken even by private entities.[211] Accordingly, the combination of these two articles, coupled with the purpose of the Outer Space Treaty (as exposed in its preamble that recognizes the "use and exploration of outer space in the interest of all States"), concludes to an absolute character of the "non-appropriation" principle; outer space cannot be appropriated by either States or private

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> "[…], it is arguable that some of the fundamental principles of space law contained in the Outer Space Treaty may have attained the status of *jus cogens*. Notable examples of this may include the principle of "non-appropriation" in Article II, […]".

Indeed, norms that reflect *jus cogens* are something more than mere custom; The Barcelona Traction case (Barcelona Traction (Belg. v. Spain), 1970 I.C.J. 3 (Judgment of Feb. 5)) used the term to introduce the importance of these principles and to distinguish them from the rest of the principles of international law. The court divided international law obligations into two categories: those that are valid between two States and those that have to be respected by the entire international community due to their nature and prerogative character. The reason why these principles have to be respected under this scheme derives from their nature. Two examples of such peremptory norms are the principle of self-determination and the sovereignty over natural resources; see Brownlie, *supra note* 9, at 511; thus, the acceptance of the "non-appropriation" principle as of a customary nature does not amount to a *jus cogens* nature.

[208] According to Art. 38 of the ICJ Statute custom is a source of international law in the same way as treaties are; see also, Vladlen S. Vereschetin, Gennady M. Danilenko, "Custom as a Source of International Law of Outer Space" (1985) 13 J. Space L. 22, at 29:

> "In the course of time, and with the development and consolidation of general, constant and uniform state practice in the field of passage of space objects, this local custom may be gradually transformed into a general rule of customary law that is binding upon all States".

[209] *Supra notes* 189, 207, at 168 and 155, at 29.

[210] *Supra notes* 185, at 40 and Tronchetti, 102, at 200.

[211] This question also occupied the discussion of the IISL/ECSL Space Law Symposium of 2004 where Dr. Leslie Tennen "argued that the legal framework, including the requirement for States to authorize and supervise national activities in space and the provisions regarding liability for damages, will ensure significant protection to private entities, and will safeguard the future of space commerce rather than hamper it"; see, IISL/ECSL Law Symposium 2004, "New Developments and the Legal Framework covering the Exploitation of Resources of the Moon".

entities. The argument behind this thought is twofold; first, the prohibition of national appropriation in Article II is expressly provided,[212] and the responsibility of States for activities undertaken by their private entities is also clear.[213] Thus, States cannot supervise and allow the realization of space activities to which they are not entitled, since they will bear international responsibility for breaching their international obligations. The second crumble of this argument fulfills this perspective by stating that such an approach satisfies the purpose and object of the preamble of the Outer Space Treaty;[214] had private appropriation been allowed, the consequent ownership on parts of outer space would have deprived the rest of space actors from having access to them and would have led to an immediate violation of the national appropriation prohibition.[215]

Art. II

> "clarifies the status of outer space and the celestial bodies as an area, which cannot be subject to State appropriation, However, it has been disputed whether or not this statutory provision excludes any kind of commercial exploitation. Although this is not entirely agreed with, the widespread majority is of the opinion that Article II only explicitly prohibits any appropriation of areas, be it in outer space or celestial bodies, be it by States or by private entities,"

[212] Art. II of the Outer Space Treaty: "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."

[213] Art. VI of the Outer Space Treaty:

> "States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, 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, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty."

[214] This interpretation is to safeguard the concept of "common interest of mankind" as stated in the preamble of the treaty; see, C. B. Bourne, *The Canadian yearbook of International Law, Vol. 8* (Canada: The University of British Columbia Publications Centre, 1969), at 36.

[215] Frans von der Dunk, Fabio Tronchetti (Eds.), *Handbook of Space Law* (U.K., USA: Elgar (research handbooks in international law), 2015), at 780: "[…] the prohibition of appropriation of outer space is a cardinal principle of space law. Therefore, it is not clear why private operators should be allows to appropriate celestial bodies when States are forbidden to do so".

specifically states Stephen Hope.[216]

On the contrary, an adverse interpretation has also been introduced in the academic community by Stephen Gorove, according to which, private appropriation of outer space is absolutely allowed by following a strict interpretation of the letter of the law.[217] For Gorove, the wording of Article II of the Outer Space Treaty clearly states that only "national appropriation by claim of sovereignty" is prohibited.[218] An opposite interpretation "would likely have gone well beyond the desires of those who regard private initiative and enterprise as an important contributor to the exploration and development of celestial bodies."[219] Thereby, according to Gorove, States are not allowed to claim ownership of outer space by extending their sovereignty, while private entities can acquire property rights in outer space, the latter not being expressly forbidden.[220] Should the legislator wish the opposite, the prohibition would have been expressly extended to cover private ownership as well, according to Gorove.[221] Although his opinion seems to be logical and close to the pure meaning of the wording under question, he omitted to take into account the previously mentioned analysis *in re* the state-oriented responsibility system as guaranteeing

[216] UNOOSA, *Disseminating and Developing International and National Space Kaw: The Latin America and Caribbean Perspective*, Proceedings, UN/Brazil Workshop on Space Law (United Nations Publications, 2005), at 7.
[217] Stephen Gorove, ""Freedom of Exploration" and Use in the Outer Space Treaty: A Textual Analysis and Interpretation" (1971) 1 J. of Int'l L. & Policy 93, at 106: "Were the provisions interpreted and enforced more strictly, it could seriously undercut individual incentive and hamper further space explorations."
[218] The same opinion is supported by Alan Wasser & Douglas Jobes, "Space Settlements, property Rights, and International Law: Could a Lunar Settlement Claim the Lunar Real Estate it Needs to Survive?" (2008) 73 J. Air L. & Com. 37, at 47.
[219] Gorove, *supra note* 217, at 94.
[220] Stephen Gorove, "Interpreting Article II of the Outer Space Treaty" (1969) 37 Fordham Law Review 349, at 351-352.
[221] *Ibid.*; however, the same scholar has supported also the opposite, see, Stephen Gorove, "The Concept of "Common Heritage of Mankind": A Political, Moral or Legal Innovation?" (1971-1972) 9 San Diego L. Rev. 390, at 397: "Otherwise strong doubts could be expressed regarding the authority or legitimacy of such a body to dispose of property rights and interests which have been vested in all mankind."

abstention form public appropriation and as embodied in Article VI of the Outer Space Treaty. As such, his interpretation has not widely been accepted by the academic community.[222]

> "Therefore, the absence of any reference to private appropriation in Article II does not mean that private operators are allowed to obtain property rights in outer space or over its resources. On the contrary, the prohibition of national appropriation of outer space and celestial bodies as expresses in the Treaty results in implicit extension to private parties."[223]

However, none of the above approaches and interpretations of Article II seems to be satisfactory; whilst the first is rigid by preventing *corpus juris spatialis* from adapting to the needs of the times that demand independent private participation, the main weakness of the second lies in that it arbitrarily compels the whole responsibility system of the Outer Space Treaty.

As a result, a balancing interpretation that will both respect the context of space law provisions and allow its adjustment to the current needs has to be attempted. Whether the "non-appropriation" principle can expand to include private entities or not remains an issue to be examined *ad hoc* and by taking into consideration the specific characteristics of the respective activities.

In this regard, the provisions of the VCLT[224] regulating the interpretation of international treaties have to be taken into account; according to Art. 31 of the above legal instrument, the

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[222] See for example Jakhu, *supra note* 131, at 220: "This view cannot be fully justified since letting private entities to appropriate outer space would defeat the very purpose of Article II, and consequently, the treaty itself. Article II is also understood to negate appropriation in the form of public or private property rights."

[223] Tronchetti, *supra note* 102, at 30.

[224] Art. 31, para. 1, 2 VCLT:

> "1. 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.
> 2. The context for the purpose of the interpretation of a treaty shall comprise, in addition to the text, including its preamble and annexes:
> (a) any agreement relating to the treaty which was made between all the parties in connection with the
> conclusion of the treaty;
> (b) any instrument which was made by one or more parties in connection."

context, object and purpose of the treaties have to be respected.[225] Therefore, the examination of the ambit of the "non-appropriation" principle seems vital in light of the specific circumstances encompassed in the case of celestial bodies and their very characteristics considered from the perspective of Art. 31 of the Vienna Convention.

B. Denying the Establishment of Ownership on the Surface and Subsurface of Celestial Bodies

It is conventionally accepted that the use of the surface of the celestial bodies is expressly allowed in Art. IV para. 2 of the Outer Space Treaty, which reads:

> "The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the Moon and other celestial bodies shall also not be prohibited",

whereas Art. 8 of the Moon Agreement that *expressis verbis* provides that "[…] States Parties may, in particular: land their space objects on the Moon and launch them from the Moon; place their personnel, space vehicles, equipment, facilities, stations and installations anywhere on or below the surface of the Moon."

The question to be raised is whether this kind of use of celestial bodies can amount to ownership on the surface and subsurface on which such use takes place. The issue is triggering for private space actors involved in such activities, since their activities require the establishment of

[225] Art. 31, para. 1 VCLT: "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."

facilities and installations on celestial bodies, which could interfere with the interests of other States desiring to use same spots.[226]

From a normative perspective, the wording of article II of the Outer Space Treaty presents celestial bodies as parts of the outer space and as governed by the "non-appropriation" principle. However, as *Gorove* observes no distinction between the various parts of the celestial bodies is made in the treaty.[227] The inquiry that follows revolves around whether the surface and the subsurface of the celestial bodies should be treated equally.

As to the surface and subsurface of the celestial bodies the following are to be noted: first, as parts of outer space, the surface and subsurface of the celestial bodies can be characterized as *res communis omnium*,[228] and thus cannot be subject to appropriation, as explained earlier in this thesis. Second, the principle of free access of States to outer space as encompassed in Art. I of the Outer Space Treaty is applicable here.[229] Indeed, this is the main barrier to acquisition of property rights on the surface and subsurface of celestial bodies. According to the definition of the notion "property", the three elements that compose it –*usus, fructus, abusus* – must be present for the establishment of ownership on a celestial body.[230] In the case in question only the first element

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[226] Sparkling, *supra note* 146; further, Article IX assumes that a "use" might be of such a magnitude as to cause "potentially harmful interference" with the activities of other States. This implies that a "use" can involve conduct on a large scale that creates a significant external effect."

[227] Stephen Gorove, "Property Rights in Outer Space: Focus on the Proposed Moon Treaty" (1974) 2 J. Space L. 27, at 28:

> "A second innovation incorporated in the draft is that, unlike the Outer Space Treaty under which the prohibition of appropriation extended "to the moon and other celestial bodies", without a distinction as to surface, sub-surface or natural resources, the draft treaty limits its prohibition to the "surface or sub-surface" of the moon or other celestial bodies."

[228] Such nature has been doubted, however, by Mafred Lachs, in light of an non-materialistic nature of the celestial bodies; Lachs, *supra note* 104, at 46: "However, their application [of the terms *res communis, res communis omnium* and *res extra commercium*] to outer space and celestial bodies is conditioned by a reply to a basic question: "Is outer space with the celestial bodies a 'thing' – *res* within the meaning of the law?"". However, as explained in the first chapter outer space and the celestial bodies can be attributed this notion.

[229] Art. I para. 2: "Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States […]."

[230] See previous section of this chapter referring to the definition of these terms.

seems to be legally applied on the surface and subsurface of celestial bodies. Indeed, this interpretation stays in accordance with both Art. I of the Outer Space Treaty and Art. II, the former allowing the use, while the latter prohibiting appropriation. Thus, the elements of *fructus* and *abusus* cannot be attributed to the use of the surface and subsurface of celestial bodies; in fact, such use would amount to exclusion of the other States from benefiting from the same part, infringing the principle of "free access".[231] Such an approach would amount to a "first come, first own" analysis that can only be applied to areas of a *terra nullius* nature, to which outer space does not qualify,[232] and should be avoided, according to Reinstein, on grounds of non-discriminatory access to outer space as provided for in Art. I of the Outer Space Treaty.[233] In the same manner, the third element of *abusus* cannot be validly supported for the surface and subsurface of the celestial bodies. Otherwise, it would both neglect the demands of Art. I and II of the Outer Space Treaty and the status of outer space as *res communis omnium*.[234] Indeed, the non-abundant nature of the resources of the celestial bodies[235] coupled with the inevitable exclusion from use justifies

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[231] Edward Lee Hudgins (Ed.), *Space: The Free-Market Frontier* (U.S.A: Cato Institute, 2002), at 97.

[232] However, the opposite view has been supported and recognizes a "first in time, first in right" approach for both outer space and the high seas, see, Carol R. Buxton, "Property in Outer Space: The Common Heritage of Mankind Principle vs. the 'First in Time, First in Right' Rule of Property Law" (2004) 69 J. Air L. & Com. 689, at 691.

[233] Ezra J. Reinstein, "Owning Outer Space" (1999) 20 Northwestern J. of Int'l L. & Bus. 59, at 64:

> "A regime based on the "right of grab," the first-come, first-served theory of property acquisition, should be feared. By the time space-incapable nations develop the technological prowess and capital reserves to fund meaningful development of outer space, the earlier space-faring nations, left unchecked, might already have locked up the most accessible and valuable resources."

[234] This is to say that that free-access principle would have been abrogated in the opposite case by allowing the disposal of parts of the outer space and simultaneously prohibiting their use by other States.

[235] "H_2O will open up a Trillion Dollar Market in Space", online: Planetary Resources <http://www.planetaryresources.com/asteroids/#market-for-h20>: "Of all constraints to the expansion of humanity off Earth, our dependence on Earth-sourced water is the most limiting. Sustained growth into the Solar System requires use of the local resources. Fortunately, asteroids are the most abundant, accessible source of water in space"; Stephen Shaw, "Posts Tagged 'rare earth metals from asteroids'" (21 August 2012), online: Astronomy Source <http://www.astronomysource.com/tag/rare-earth-metals-from-asteroids/>; "Asteroids contain an abundance of valuable resources including platinum, gold, iron, nickel, rare earth metals and water. At present around 9,000 known asteroids travelling in an orbit close to Earth's have been identified, with around 1,000 new ones being discovered each year, all of which as easy to reach as the moon"; Dan Vergano, "An 'Abundance' of Targets for Asteroid Miners" (27 May 2012), online: USA Today <http://usatoday30.usatoday.com/tech/science/columnist/vergano/story/2012-05-28/asteroid-miners/55237692/1>; J. Lewis, M. S. Matthews & M. L. Guerrieri, *Resources of Near-Earth Asteroids*

the above interpretation by simultaneously respecting the provisions of the *corpus juris spatialis*. Hence, the surface and subsurface of celestial bodies are only subject to a limited use that cannot amount to ownership on them.[236] Indeed, to the same end is expressly argued in Art. 11 para. 3 of the Moon Agreement which reads:

> "Neither the surface nor the subsurface of the Moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or nongovernmental organization, national organization or non-governmental entity or of any natural person".

Consequently, ownership of such immovable parts of celestial bodies is not legally feasible on the grounds of both an interpretation of the Outer Space Treaty and a mere reading of the Moon Agreement.

The opinion of Gorove, according to which such restrictions apply only to State but not to private entities as presented earlier, does not qualify as valid in the specific case of the surface of celestial bodies on the grounds of the earlier analysis on this issue. As a result, private entities cannot claim ownership over the surface and subsurface of celestial bodies without infringing the existing international space law regime.

C. Conceptualizing Private Ownership of Removable Parts of Celestial Bodies

(U.S.A: University of Arizona Press, 1993), at 543, online: National Space Society <http://www.nss.org/settlement/spaceresources/resources3.html>.

[236] Lee, *supra note* 228, at 181; Tronchetti, *supra note* 102 at 42; Viorel Badescu, *Moon: Prospective Energy and Material Resources* (Heidelberg: Springer, 2012), at 536; see also, *Proposals of Austria on the Draft Treaty Relating to the Moon*, UN-COPUOS, 60th Sess, UN Doc A/AC.105/L.74 (1973), at 1.

Eric Anderson[237] has characterized the natural resources of celestial bodies as the "low-hanging fruits of the solar system".[238] Indeed, space minerals qualify as the removable parts of the celestial bodies that constitute an attraction pole for the private enterprise.[239] The feasibility of ownership acquisition on them is not too far in the future to be legally framed. The Moon Agreement already recognizes property rights on samples that serve scientific missions and are collected in outer space,[240] while the Outer Space Treaty promotes the facilitation of such activities without specifically referring to the ownership status of samples of celestial bodies.[241] In this

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[237] Eric Anderson is the Chairman of Space Adventures Ltd., the Co-Founder of Planetary Power Inc. and the Co-Chairman of Planetary Resources, Inc.; see "Biography: Eric C. Anderson, Entrepreneur", online: Ecanderson <http://www.ecanderson.com/Speaker_Bio>.

[238] "Precious Metal Hunters Look to Outer Space" (21 November 2013), online: Reuters <http://www.cnbc.com/2013/11/21/precious-metal-hunters-look-to-outer-space.html>.

[239] Steven Mars, "Private Enterprise Space Launchers Performed and Funded by SpaceX", online: Act For Libraries <http://www.actforlibraries.org/private-enterprise-space-launches-performed-and-funded-by-spacex/>: "Some of the plans for space exploration involvement by private enterprise include transporting cargo and asteroid mining"; Emily Calandrelli, "The Potential $100 Trillion Market For Space Mining" (9 July 2015), online: TechCrunch <http://techcrunch.com/2015/07/09/the-potential-100-trillion-market-for-space-mining/>: "Some are estimated to be worth more 100 trillion dollars. It's a number large enough to turn any potential investor's head"; for information about the worth of such materials see online: Asterank <http://www.asterank.com/>; Zeev Kirsh, "Asteroid Mining? - the Wrong & Right Reasons to Invest in this Critical Enterprise" (3 April 2013), online: Institute for Ethics and Emerging Technology [hereafter "IEET"] <http://ieet.org/index.php/IEET/more/krish20130403>: "One is left wondering how much money the DSI private contractors are plowing into the initial Public Relations investment of the DSI front, hoping to get paid back through their profit margin off obtaining construction contracts from NASA"; Kenneth Chang, "A Business Plan for Space" (9 February 2015), online: NY Times <http://www.nytimes.com/2015/02/10/science/a-business-plan-for-space.html?_r=0>:

> "In December 2013, Bigelow asked the F.A.A. to review a proposal for landing one of its habitats on the moon for use as a lunar base. Bigelow said it might conduct scientific research or commercial endeavors like mining. Robert Bigelow, the company's founder, has said he is aiming to establish his lunar base around 2025, and the company wanted to start clarifying issues."

[240] Art Dula, "Free Enterprise and the Proposed Moon Treaty" (1979-1980) 2 Hous. J. Int'l L. 3, at 11.

[241] Art. IV, para. 2 of the Outer Space Treaty: "The use of any equipment or facility necessary for peaceful exploration of the Moon and other celestial bodies shall also not be prohibited"; Art. 6 of the Moon Agreement:

> "In carrying out scientific investigations and in furtherance of the provisions of this Agreement, the States Parties shall have the right to collect on and remove from the Moon samples of its mineral and other substances. Such samples shall remain at the disposal of those States Parties which caused them to be collected and may be used by them for scientific purposes";

this provision of the Moon Agreement should not be granted low significance due to the limited acceptance of the Agreement. On the Contrary, it constitutes a first indication of the appropriable nature of the resources, *i.e.* removable parts, of outer space; see Tronchetti, *supra note* 102, at 225:

> "The Agreement's provisions cannot be completely disregarded just because it has received limited acceptance: the refusal of States to ratify the Agreement because of the presence of the 'Common

manner, the purpose of both treaties to facilitate the uses of outer space from a scientific perspective is fulfilled. Various interpretations have been attributed to the respective provisions of the Outer Space Treaty and the Moon Agreement in order to allow or restrict ownership on the removable parts of celestial bodies. The main argument of those opposing to an appropriable nature of celestial bodies removable parts lies in a mere interpretation of the letter of the law; this school of thought considers the removable parts of the celestial bodies (*i.e.*, the minerals entailed therein), as part of outer space that enjoy the same nature.[242] The inadmissibility of exploiting mineral resources and further owning them is based on the principle that considers outer space, and thus its natural resources, as being in the "common interest of all States" and as *res communis*, and the one that requires the use of outer space "in the benefit and in the interest of all countries".[243]

> "Any substantive deviation from this would have grave implications for the international regulatory regime of outer space. Any act of appropriation, be it by way of state action or those of private entities/natural persons would have the effect of excluding others from enjoying the access of outer space as guaranteed by the freedom principle"

is stated in a commentary for Art. II of the Outer Space Treaty.[244] However, later the same commentary questions whether such exploitation of celestial bodies could be truly regarded as appropriation or it simply falls within the ambit of the term "use" without triggering appropriation

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> Heritage of Mankind' doctrine does not decrease the importance of the fact that, during the negotiations of the Agreement itself, a general consensus on the possibility to exploit lunar and other celestial bodies' resources was reached."

See also, the opinion of Bin Cheng as interpreted in UN-COPUOS Legal Subcommittee discussions; *Answers from the Chair of the Space Law Committee of the International Law Association (ILA) to questions by the Chair of the Working Group of the LSC*, Un-COPUOS, Legal Subcommittee, 54th Sess, UN Doc A/AC.105/C.2/2015/CRP.25 (2015), at 7.

[242] Virgiliu Pop, "A Celestial Body is a Celestial Body is a Celestial Body …" (October 2001), presented at 52nd International Astronautical Federation [hereafter "IAF"] Congress, online: Space Future <http://www.spacefuture.com/archive/a_celestial_body_is_a_celestial_body_is_a_celestial_body.shtml>.

[243] See preamble and Art. I of the Outer Space Treaty in conjunction with the Preamble of the Moon Agreement that refers to the principles encompassed in the Outer Space Treat.

[244] Freeland, *supra note* 195, at 58.

questions.[245] This is, indeed, the way in which the similar problem of mining natural resources of the high seas has been treated: The UNCLOS does not prohibit the extraction of minerals and the acquisition of property rights on them by the extracting entities.[246] It even regulates the issues in details and does not consider it as infringing the "freedom of access" principles entailed in the same convention.[247]

Thus, such an approach that acknowledges the use of parts of the celestial bodies without *ab initio* prohibiting their appropriation seems closer to the spirit of the Outer Space Treaty by realizing its purpose as to the amelioration of terrestrial life.[248] In fact, major space-faring nations have adopted such a view by admitting that the extracting entities should foster ownership on the extracted materials as recognition of their efforts.[249] This is the direction that the private sector desires, so that such an exploitation of outer space is no more legally hampered; one such entity emphasized that it desires "confirmation that private entities which extract resources from the surface or subsurface of the moon, asteroids, or other celestial bodies own and may utilize or transfer such resources, once extracted, as they see fit".[250]

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[245] *Ibid.*, at 58: "What the Outer Space Treaty prohibits is an 'appropriation by use' not the 'use' of outer space".

[246] See for example the provisions of Art. 13, para. 5 (b) and Art. 17, para. 2(c) of UNCLOS that reveal the exploitable and commercializable nature of the resources of the deep seabed: "The said market value shall be the product of the quantity of the processed metals produced from the polymetallic nodules extracted from the area covered by the contract and the average price for those metals during the relevant accounting year […]" and "Exploitation should be of sufficient duration to permit commercial extraction of minerals of the area and should include a reasonable time period for construction of commercial-scale mining and processing systems, during which period commercial production should not be required. […]."

[247] See Art. 87, para. 1 of UNCLOS I which it is stated that "The high seas are open to all States, whether coastal or land-locked. Freedom of the high seas is exercised under the conditions laid down by this Convention and by other rules of international law" in coalition with the provisions cited in *supra note* 246. While the first provides for the free access to the high seas, the exploitation of its resources, *i.e.* the resources of the deep seabed, is provided for in the same Convention without being contradictory to the concept of the free access by all States.

[248] As exposed in the UN Resolutions that reveal the purposes, aims and intentions of the international community; GA Res 1348 & 1721, *supra notes* 8 and 11.

[249] Viorel, *supra note* 236, at 557: "Whereas the immovable examined above are subject to the *lex situs* of outer space, extracted resources are movables, subject mainly to the *lex domicilii* of the person who caused their removal."

[250] NASA, *supra note* 23.

Therefore, an interpretation to justify that ownership on parts extracted from celestial bodies does not qualify as appropriation of parts of outer space, but solely as a mere consequence of the use of outer space, could be deemed more than convenient for the enablement of the private space industry and at the same time not contradictory to the provisions, principles and concepts of the Outer Space Treaty as well, as it is illustrated in the graphic (see, annex).

The same result is also derived by an explicit interpretation of the Moon Agreement; although Art. 11 of the agreement excludes the natural resources of celestial bodies from appropriation by providing that "[n]either the surface nor the subsurface of the Moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or nongovernmental organization, national organization or non- governmental entity or of any natural person", it does not prohibit their use and exploitation. On the contrary, it clearly foresees and welcomes such exploitation by stating in papa. 7 of its Art. 11 that: "States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible." Consequently, the perception that the exploitation of outer space natural resources and the activities that require extraction of such resources and ownership on them is a facet of the "use" of outer space, grants the legality to establish property on such resources. Besides, Art. 31 para. 2 of the VCLT introduces an interpretation harmonized with the purposes of the treaty, which in this case seems to welcome such approach.[251]

This is enhanced by the compliance of such interpretation with the three notions to establish the classic meaning of "property", the *usus*, the *fructus* and the *abusus*; the first is acceptable since

[251] Art. 31, para. 2 of the VCLT: "the context for the purpose of interpretation of a treaty shall comprise, in addition to the text, including its preamble and annexes: (a) Any agreement relating to the treaty which was made between the parties in connection with the conclusion of the treaty; […]"

it qualifies as "use" of outer space as allowed in Art. I of the Outer Space Treaty; the second can be regarded as a consequence of this "use" since the extraction of the natural resources comes as inevitable of the use of the celestial bodies; the last element can be justified as a condition necessary to support the *usufruct* – "enjoyment" – of this procedure. Indeed the concept of *abusus* is fulfilled in a particular way and by taking into account the abundant nature of the resources of outer space; such nature allows other entities to have access to other resources and as such the "freedom of exploration and use" principle of Art. I of the Outer Space Treaty is not infringed.[252]

It is thus alleged, that the appropriation of parts of the celestial bodies cannot legally take place *ab initio*. It is feasible only: (1) as a consequence of the use of celestial bodies, (2) given that there are sufficient accessible resources left to be exploited by other entities and, (3) given that the celestial bodies are not completely harvested (*i.e*, vanished). Therefore, this kind of ownership can take place only under the aforementioned conditions.

V. A "Common Heritage of Mankind" Perspective: Obstruction or Denouement?

The Moon Agreement, although an international legal instrument that did not enjoy full acceptance by the international community,[253] entails significant provisions as to the exploitation of the resources of celestial bodies and the subsequent property rights that can be acquired on them. The main provision enshrined in this Agreement – and the one that caused the limited acceptance of the Agreement[254] – is the "common heritage of mankind" concept that derived from the UNCLOS and is encompassed in Art. 11 of the Agreement. Article 11 states that "the Moon and

[252] See graphic in Annex, at 104.
[253] UNODA, *supra notes* 80, 81, UN, *supra note* 82.
[254] Michael Simpson, "Future of space commercialization - mining asteroid and celestial bodies" in Chapter 7.5 of *Commercialisation of Space: Opportunities and Challenges* (India: Pentagon Press, 2014), at 5: "the Moon Treaty has a substantial weakness for those who would seek to make it the foundation for preventing those advocating the mining of celestial bodies from proceeding with their objectives: it has a very small number of ratifications and signatures."

its natural resources are the common heritage of mankind". This concept, being one of international law, was encountered for the first time in Art. 136 and 137 (1), (2) of the UNCLOS which respectively read: "The Area and its resources are the common heritage of mankind" and

> "No State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or juridical person appropriate any part thereof. […]The minerals recovered from the Area, however, may only be alienated in accordance with this Part and the rules, regulations and procedures of the Authority".[255]

It can be thus assumed that the principle considers areas beyond sovereignty as being protected under the notion "heritage" and their natural resources as exploitable by States and as expressly provided in the specific respective provisions[256] of the UNCLOS.[257]

However, in reference to the respective concept as enshrined in the Moon Agreement, its rejection by the academic community, and especially by the U.S., was based exactly on the fact that outer space belongs to the humankind and is vested the nature of "common heritage".[258] This perception led States to believe that private entities have no place in the exploitation of outer space,

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[255] The concept was proposed in the UN GA Declaration of 1970 referring to the Seabed and then encompassed in the UNCLOS; *Declaration of Principles Governing the Seabed and Ocean Floor*, UNGAOR, 25th Sess, UN Doc A/RES/25/2749 (1970): "The sea-bed and ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction […], as well as the resources of the area, are the common heritage of mankind"; Graham Nicholsonf, "The Common Heritage of Mankind and Mining: An Analysis of the Law as to the high Seas, Outer Space, the Antarctic and World Heritage" (2002) 6 N.Z. J. Envtl. L. 177, at 180; Jeremy L. Zell, "Putting a Mine on the Moon: Creating an International Authority to Regulate Mining Rights in Outer Space" (2006) 15 Minn J. Int'l L. 489, at 492.

[256] Art. 137, para. 2 of the UNCLOS: "The minerals recovered from the Area, however, may only be alienated in accordance with this Part and the rules, regulations and procedures of the Authority."

[257] Peter Payoyo, *World Inequality, Sustainable Development and the Common Heritage of Humanity* (The Netherlands: Martinus Nijhoff Publishers, 1997), at 241, 242; Timo Knaebe, *The Principle of Common Heritage of Mankind in the New Law of the Sea: An African perspective based on Nasila S. Rembe's Work* (Germany: Auflage, 2006), at 4; René Jean Dupuy & Daniel Vignes, Eds., *A Handbook on the New Law of the Sea. 2* (U.S.A, The Netherlands: Kluwer Academic Publishers, Academie du droit International, 1991), at 11254; Robin Rolf Churchill & Alan Vaughan Low, *The Law of the Sea* (U.S.A: Manchester University Press, 1983), at 171 – 173; David Kenneth Leary, *International Law and the Genetic Resources of the Deep Sea* (The Netherlands: Martinus Nijhoff Publishers, 2007), at 96; Helmut Tuerk, *Reflections on the Contemporary Law of the Sea* (The Netherlands: Martinus Nijhoff Publishers, 2012), at 33; Natalie Klein, *Dispute Settlement in the UN Convention on the Law of the Sea* (Cambridge: Cambridge University Press, 2003), at 323; Crier C. Raclin, "From Ice to Earth: The Adoption of a regime to Govern Resource Exploitation of Outer Space" (1985-1986) 7 Nw. J. Int'L. & Bus. 727, at 737, 739.

[258] Tronchetti, *supra note* 102, at 60; Kemal Baslar, *The Concept of the Common Heritage of Mankind in International Law* (The Netherlands: Martinus Nijhoff Publishers, 1998), at 163.

since the latter qualifies as "common heritage of mankind" and thus prevents private exploitation of outer space.[259] This was schematically illustrated in the view of the U.S. as expressed during the hearing before the UN-COPUOS legal subcommittee that preceded the drafting of the Agreement, according to which the Agreement serves political interests and thus constitutes a barrier to exploitation:[260]

> "Thus, the intention of the intention behind the phrasing of Article 11 (1) is exactly what the word imply, namely that the "common heritage" concept in the Moon Treaty finds its meaning solely within the Moon Treaty itself. On behalf of the United States, moreover, this interpretation was unequivocally set forth by the Ambassador Petree in his statement of November 7, 1979, before the U.N. Special Political Committee as it debated the Treaty. This statement on the record and uncontradicted, is legally authoritative as a matter of treaty interpretation under relevant international law. […] There is, of course, an opposing point of view. Thus, it can be argued with equal vigor that, when the parties to the Moon Treaty assemble 15 to 30 years from now to negotiate about international regime, each party will bring to the table arguments favoring its-own interests."[261]

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[259] Scott J. Shackelford, "The Tragedy of the Common Heritage of Mankind", online: <http://www.iew.unibe.ch/unibe/rechtswissenschaft/dwr/iew/content/e3870/e3985/e4139/e6410/sel-topic_5-shackleford_ger.pdf>, at 2:

> "Now today, CHM regimes are being challenged by private sector representatives, a subset of developed nations and emerging markets, demonstrating that territorial sovereignty is still quite strong in the international system despite its myriad practical challenges. This cycle is at odds with the goal of CHM, which seeks to preserve and equitably distribute resources for the benefit of mankind and posterity."

The fear of the United States that made it refrain from signing the Moon Agreement was also based on the "equitable sharing" of the resources as provided for in Art. 11, para 6 of the Agreement. In such a way, the benefits derived from entities of developed countries, such as the United States, would have to be shared with the developing ones that do not possess the technological capabilities to compete; see, Michael Listner, "The Moon Treaty: failed international law or waiting in the shadows?" (24 October 2011), online: The Space Review <http://www.thespacereview.com/article/1954/1>; see also, Tronchetti, *supra note* 102, at 48-50 for the justification of the U.S. view.

[260] Lee, *supra note* 207, where it is cited that:

> "In effect the developed States have agreed that the common heritage of mankind principle means that an international regime should control resources exploitation. In exchange for this concession, the developing countries agreed not to insist on provision imposing a moratorium on exploitation pending the establishment of the international regime. Thus the moon Agreement expresses no moratorium, and none is implied by its legal history",

as referenced in fn. 299 of the book.

[261] *Hearings before the subcommittee on Science, Technology and Space of the Committee on Commerce, Science, and Transportation, United States Senate, 96th Congress, 2nd session on the Moon Agreement* (29, 31 July 1980) Serial

Indeed, the Moon Agreement can be characterized as a legal instrument of dubious validity as to acquisition of celestial bodies and their resources by private entities, since its provisions are contradictory: While Art. 11, para. 1 regards celestial bodies and their resources as "common heritage of mankind," para. 2 reiterates their non-appropriable nature as provided for in Art. II of the Outer Space Treaty.[262] Even by expanding such nature to the surface, subsurface and natural resources of celestial bodies,[263] para. 4 and 7 of the Agreement imply as legally feasible the exploitation of such outer space parts: In fact, para. 4 of Art. 11 foresees the exploitation of the resources by rendering States responsible to establish an international regulatory mechanism in case such exploitation takes place,[264] and para. 7 asks for an "equitable sharing" of the resources extracted from outer space.[265] Consequently, two rational questions arise: "What kind of mechanism will be established by States to regulate the exploitation of space natural resources and what kind of "equitable sharing" will take place, if the potential of appropriation of natural

No. 96-115 (Washington: Printed for the Use of the Committee on Commerce, Science and Transportation, U.S. Government Printing Office, 1980).

[262] Art. II of the Outer Space Treaty: "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"; see also scholarship that supports the customary nature of the provision; Jijo George Cherian & Job Abraham, "Concept of Private Property in Space – An Analysis" (2007) 2 J. of Int'l Comm. L. and Technology 211, at 214.

[263] Art 2 of the Moon Agreement: "Neither the surface nor the subsurface of the Moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or nongovernmental organization, national organization or non- governmental entity or of any natural person."

[264] Art. 11, para. 4 of the Moon Agreement: "States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible"; Richard Berkley, "Space Law versus Space utilization: the inhibition of Private Industry in Outer Space" (1996-1997) 15 Wis. Int'l L. J. 421, at 427.

[265] Art. 11, para. 6 of the Moon Agreement:

> "An equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon, shall be given special consideration";

Lynn M. Fountain, "Creating Momentum in Space: Ending the Paralysis Produced by the 'Common Heritage of Mankind' Doctrine" (2002-2003) 35 Conn. L. Rev. 1753, at 1759.

resources is *ab initio* excluded?"[266] While the answer to these questions falls beyond the ambit of this study, the questions *per* se, indicate the foreseeability of a legal extraction and "use" of the natural resources (*i.e.* a use that entails removal and thus possession of the resources).[267]

Hence, the international community should be reconsidering a broader acceptance of the Moon Agreement, on the grounds that the Agreement can probably be interpreted in favor of private entities seeking property rights on the celestial bodies and their resources and as such facilitate their exploitation.

VI. Private Attempts to own Outer Space

Recently, claims for private ownership of celestial bodies have occupied court rooms proving the practical reflection of this discussion and enhancing the non-appropriable nature of the surface of celestial bodies.

In November 2003, Mr. Gregory W. Nemitz, a U.S. citizen, filed a lawsuit against NASA and the U.S. government in the District Court of Nevada,[268] claiming ownership on an asteroid named Eros 433.[269] He accused NASA of permanently landing its spacecraft, named NEAR, on his asteroid without paying the respective parking lot fees.[270] He also accused the U.S. government of rejecting Mr. Nemitz's property rights on the asteroid. His first allegation was based on the registration of an ownership claim in the Archimedes website.[271] His second allegation, against the

[266] Clas G. Wihlborg & Peter Magnus Wijkman, "Outer Space Resources in Efficient and Equitable Use: New frontiers for Old Principles" (1981) 24 J. of L. and Ec., at 41.
[267] *Responses to the set of Questions provided by the Chair of the Working Group on the Status and Application of the Five United Nations Treaties on Outer Space*, UN-COPUOS, 52nd Sess, UN Doc A/AC.105/C.2/2013/CRP.13 (2003), at 4: "The Moon Agreement does not preclude any modality of exploitation, by public or private entities, or prohibit the commercialization of such resources, provided that such exploitation is compatible with the principle of a common heritage of mankind."
[268] *Nemitz v. The US Slip*, WL 316704 D. Nev. (2004).
[269] *Ibid*., at introduction.
[270] *Ibid*..
[271] *Ibid*..

State Department, was based on the fact that he used the asteroid as collateral when filling a security interest under the Uniform Commercial Code in California.[272] Before filling his lawsuit in the federal court, both NASA and the Department of State rejected his allegations. In response, the U.S. Department of State declared that "in view of the Department, private ownership of an asteroid is precluded by Article II […] of the Outer Space Treaty. Accordingly we have concluded that your claim is without legal basis."[273]

Mr. Nemitz claimed ownership on the asteroid by supporting that he derived this right from the provisions of a series of Amendments to the U.S. Constitution;[274] according to his opinion, the provisions of the Amendments qualified him as able to acquire extraterrestrial property.[275] In this respect, he also stated that "no treaty has ever abrogated, overthrown, or amended constitutional law"[276] in his effort to prove the international obligations of the U.S. were not binding upon him since national law prorogates.

However, his allegations found no solid legal ground, and the court rejected his claims on the reasoning that neither his registration in the Archimedes website, nor the filling of the Uniform Commercial Code security interest were enough to legally enforce his arguments.[277] Mr. Nemitz, however, insisted by appealing to the ninth circuit Court of Appeals and by supporting this time

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[272] *Ibid.*.
[273] Virgiliu Pop, *Who Owns the Moon?: Extraterrestrial Aspects of Land and Mineral Resources Ownership* (The Netherlands: Springer, 2009), at 146.
[274] *Nemitz v. The US Slip*, *supra note* 268, at 4.
[275] In the Court's decision it is stated that:

> "This is an attempt by counsel to obfuscate the issues since it is made clear in the evidence and pleadings submitted herein that, registry of Plaintiff's Claim to Eros with the Archimedes Institute was for the express purpose of giving the Public Due Notice of this Claim and just one of several ways to Notice the World at Large. Said registry was not, as counsel suggests, for the purpose of reliance on such registry to prove his ownership."

[276] "Orbdev Files Federal Suit over Asteroid 433 Eros Claim" (10 November 2003), online: Space Daily <http://www.spacedaily.com/news/oped-03zzw.html>.
[277] *Nemitz v. The US Slip*, *supra note* 268, at 238.

that ownership on celestial bodies could legally be asserted by private entities, since the U.S. government has only signed the Outer Space Treaty which does not specifically exclude private ownership from the scope of the Outer Space Treaty, but not the Moon Agreement that expressly does so.[278] His claims were once more rejected by the court, which, nevertheless, did not answer on the ground of international space law,[279] but retained the justifications of the lower court to support that Mr. Nemitz did not manage to prove his ownership of the celestial body.[280]

Although Mr. Nemitz did not manage to maintain the asteroid under its ownership, neither of the courts examined the "non-appropriation" principle in details or answered the question of "whether the Outer Space Treaty allows the establishment of private property on celestial bodies".[281] Had Mr. Nemitz proved his ownership as a natural right under the U.S. law, the court would have granted his claims.

A similar case dwelled the Haidian District People's Court in 2005.[282] The case dealt with the Beijing Lunar Village Aeronautics Science and technology Co., Ltd. (or: Lunar Embassy),[283] a company that was founded in September 2005 to sell plots of the Moon online.[284] The company was advertising that anyone can buy an acre on the Moon for USD 37 and it was issuing "certificates" to ensure its customers that they had property rights on the Moon and that they were

[278] *Nemitz v. The US Slip, supra note* 268, at 2; "Your individual claim of appropriation of a celestial body (the asteroid 433 Eros) appears to have no foundation in law. Unlike an individual's claim for seabed minerals, which was considered and debated by the U.S. Congress that subsequently enacted a statute, the Deep Seabed Hard Mineral Resource Act, P.L. 96-283, 94 Stat. 533 (1980), expressly authorizing such claims. There is no similar statute related in outer space", see, Sarah Coffey, "Establishing a legal framework for property rights to natural resources in outer space" (2009) 41 Case W. Res. J. Int'l L. 120, at 140.

[279] Robert Kelly, "Case Note: Nemitz v. United States, a Case of First Impression: Appropriation, Private Property Rights and Space Law Before the Federal Courts of the United States" (2004) 30 J. Space L. 297, at 305-308.

[280] *Nemitz v. NASA et al*, U.S. Court of Appeals for the 9th Circuit, 04-16223 (2007), at 1, 2.

[281] Robert, *supra note* 279.

[282] "'Lunar Embassy' Appeals to Get Back License" (16 November 2005), online: People.com.cn <http://en.people.cn/200511/16/eng20051116_221718.html>.

[283] Lunar Embassy Ltd. website <http://lunarembassy.com/>.

[284] *Supra note* 282; Frans von der Dunk, E. Back-Impallomeni, S. Hobe & R. M. Ramirez de Arellano, "Surreal estate: addressing the issue of 'Immovable Property Rights on the Moon'" (2004) 20 Space Policy 149, at 155.

able to use it for mining activities up to three kilometers underground.[285] The company was accused of engaging in actions of "speculation" and "profiteering"[286] and its license was later suspended by the Beijing Administration of Industry and Commerce who also fined the company 50,000 yuan.[287] The Haidian Disrtict Court did not decide in favor of the company.[288]

However, Lunar Embassy appealed the decision. The Court of Appeals affirmed the lower court's decision on the basis of the provisions of the Outer Space Treaty. In particular, the court did not only use Article II of the Outer Space Treaty, which had been ratified by China in 1983,[289] to emphasize that the "non-appropriation" principle is binding upon China and its nationals, but it also used Article I of the Outer Space Treaty to highlight that ownership on parts of outer space also violates the principle of "freedom of exploration" since celestial bodies are inaccessible to any other entity.[290] The Lunar Embassy case is an example that illustrates the non-appropriable nature of celestial bodies and also the extension of this restriction to private entities.

Nevertheless, individuals did not stop trying to seek ownership rights on celestial bodies after the publication of these two cases. Indeed, a relevant issue occupied the Canadian courts in 2012: Mr. Sylvio Langevin claimed ownership of nine planets, in our and, in Jupiter's solar system along with the space among them.[291] He even claimed ownership over Earth by stating that Earth has no owner and thus he could own it: "If there was a respondent it would be God" he specifically

[285] *Ibid.*
[286] *Ibid.*
[287] *Ibid.*
[288] *Ibid.*
[289] "China: Accession to Outer Space Treaty", online: UNODA <http://disarmament.un.org/treaties/a/outer_space/china/acc/washington>.
[290] *Supra note* 282, at 306.
[291] *Langevin (Re)*, Court Supérieure du Québec, District de Québec, no 1399 (2012).

mentioned.[292] His claims were encountered with humor by the courts, while one of the judges even called him "quarrelsome," since he had been filling similar claims constantly since 2001.[293]

Although the last example can be characterized as an excessive and completely arbitrary attempt to own outer space, all judgments argue to the same end: «Outer space cannot be appropriated», justifying in such a way the "non-appropriation" principle as an obligation *erga omnes*,[294] and thus binding even upon individuals and private entities.[295]

However, none of the above cases concerned the issue of whether removable parts of the celestial bodies can be owned by private entities. The above attempts also show that the legal framework that regulates property rights on celestial bodies is not adequate to allow courts to grant such rights to private entities or individuals. However, all the above attempts were not undertaken by major space affiliated companies with strong investment plans, something that could have changed the scenery. Had this been the case, the pressure to modernize the current space law provisions would have been more noticeable. Indeed, international law is traditionally created as a necessary consequence of facts[296] and not as an *a priori* effort to regulate issues that can potentially be encountered. It is thus probable that the need to clarify notions such as the "non-

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[292] Brian Daly, "Man Sues for Ownership of Most of the Solar System" (1 March 2012), online: Toronto Sun <http://www.torontosun.com/2012/03/01/man-sues-for-ownership-of-most-of-solar-system>.

[293] Colin Lachance, "Moonraker or Lost in Space?" (20 October 2014), online: CanL II Connects <http://canliiconnects.org/en/commentaries/30202>.

[294] Such obligations enjoy a validity and acceptance higher than others due to their prevailing nature and as such derogations from them are not forgiven in international law; see Shaw, *supra note* 74, at 124:

> "[…] the existence of norms or obligations deemed to be of a different or higher status than others, whether derived from custom or treaty. These may be obligations *erga omnes* or rules of *jus cogens*. […]The former concept concerns the scope of application of the relevant rule that is the extent to which States as a generality may be subject to the rule in question and may be seen as having a legal interest in the matter."

[295] Mauricio Ragazzi, *The Concept of International Obligations Erga Omnes* (United Kingdom: Clarendon Press, 2009), at 250.

[296] Hersch Lauterpacht, Ed., *International Law: Being the Collected Papers of Hersch Lauterpacht, Volume 1* (Cambridge: Cambridge University Press, 1970), at 15.

appropriation" principle and their ambit – at a national and international level – might arise as subsequent to ongoing commercial space activities that require property rights on celestial bodies.

VII. Respective Attempts undertaken by States and their Impact on Private Space Activities

Besides private attempts of companies or individuals to own parts of outer space, the U.S. has adopted relevant regulatory policy. Although this thesis does not examine state ownership, the following legislative initiatives have to be discussed because of the impact they can have on the private space sector.

i. The Asteroids Act[297]

On 10 July 2014, Bill Posey and Derek Kilmer, two Congressmen, proposed the Asteroids Act to the Congress of the United States.[298] The purpose of this Bill was "to promote the development of a commercial asteroid resources industry for Outer Space in the United States and to increase the exploration and utilization of asteroid resources in Outer Space".[299]

The Bill tried to surpass the legal barrier of the "non-appropriation" principle of Art. II of the Outer Space Treaty. In particular, it stated that the resources that are being obtained in Outer Space from Asteroids become a property of the entity that harvests them.[300] This entity will have property rights on the extracted materials and, consequently, the entity will be able to commercially exploit them.

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[297] *American Space Technology for Exploring Resource Opportunities In Deep Space Act*, 13th Congress, House of Representatives (10 July 2014) [hereafter "Asteroids Act"].
[298] Marcia S. Smith, "Posey, Kilmer Introduce ASTEROIDS Act To Grant Property Rights to Asteroid Resources" (10 July 2014), online: Space Policy Online <http://www.spacepolicyonline.com/news/posey-kilmer-introduce-asteroids-act-to-grant-property-rights-to-asteroid-resources>.
[299] Para. 51301 of the Asteroids Act; Fabio Tronchetti, "Private property rights on asteroid resources: Assessing the legality of the ASTEROIDS Act" (2014) 30 Space Policy 193, at 193.
[300] Para. 51302 (a) of the Asteroids Act: "Any resources obtained in Outer Space are the property of the Entity that obtained such resources."

The proposed Bill moves further by mentioning the non-interference principle. It specifically states that extraction of space material undertaken by U.S. private entities prevails in case other entities try to suspend them. This provision lies in a "first come, first served" ratio, even though it is contradictory to the principle of the "freedom of exploration". Moreover, the proposed Bill gives the right to U.S. entities to file the lawsuit against other entities that try to interfere with their activities.[301]

The wording of the act is simple, clear, and definite and seems to be in contrast with the provisions of the Outer Space Treaty, specifically with Art. I and II of the Treaty. Although, as stated above, property on extracted – removable – parts of celestial bodies could be limitedly accepted as a consequence of the "use" of outer space, the Bill provides property rights as such and not as a consequence of the "use". For this reason the provisions of the Bill infringe international space law and could render the U.S. responsible for such infringement under Art. VI of the Outer Space Treaty should they pass by the Senate.

The U.S. Congress also passed a similar Bill in the U.S. House of Representatives in June 2015;[302] the Bill was proposed to the House of Representatives in March 2015 referring specifically to the exploitation of space natural resources by reiterating the provisions of the Asteroids Act. It is worth mentioning that should this Bill pass by the Senate and become part of U.S. domestic law, the impact on private space activities will be noticeable: given that the provisions of the Bill do not respect the "non-appropriation" principle of Art. II of the Outer Space Treaty and the "freedom of exploration" principle of the respective Art. I, the U.S. will be rendered

[301] Para. 51302 (d) of the Asteroids Act: "A United States commercial asteroid resource utilization entity may bring an action for appropriate legal or equitable relief, or both, under this chapter for any action, by another private entity, compromising the right to conduct its operations free of harmful interference."

[302] *A Bill to promote the development of a United States commercial space resource exploration and utilization industry and to increase the exploration and utilization of resources in outer space*, 114th Congress, House of representatives (15 June 2015) [hereafter the "Space Resource Exploration and Utilization Act of 2015"].

responsible under Art. VI of the same treaty.[303] Art. VI requires that States authorize and continually supervise the space activities of their nationals and bear international responsibility emerging from such activities. As a result, should the U.S. license activities that lead to appropriation of parts of outer space, it will have to bear the respective international responsibility according to this article.

ii. The Apollo Lunar Landing Legacy Act[304]

In July 2013 another Bill was introduced in Congress. This Bill attempted to set the legal basis for the establishment of an Apollo 11 Lunar Landing Sites National Historical Park on the Moon.[305] The rationale behind the creation of such a Bill was to protect all the areas whereon astronauts and equipment connected to the Apollo 11 mission landed.[306] Given that the current technology allows States to land on the surface of the Moon and use it, the Act claimed that these areas have to be protected so that they are preserved as one of humankind's monuments for future generations.[307] The Bill did not grant property rights on these areas however, and as a consequence it did not seem to follow the concept of the Asteroids Act. It is worth mentioning that if such areas were to be solely used for the creation of a national park their use by other States would be

[303] Art. VI of the Outer Space Treaty: "States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, 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. […]"

[304] *Act To establish the Apollo Lunar Landing Sites National Historical Park on the Moon, and for other purposes*, 113th Congress, House of Representatives (8 July 2013) [hereafter the "Apollo Lunar Landing Legacy Act"].

[305] The Bill was introduced by Rep. Donna Edwars, who stated that "as preserved on the lunar surface, is now in danger, as spacefaring commercial entities and foreign nations begin to achieve the technical capabilities necessary to land spacecraft on the surface of the moon"; see, Leonard David, "Protection of Apollo Moon Landing Sites Sparks Controversy" (26 July 2013), online: Space.com <http://www.space.com/22131-moon-landing-sites-bill-controversy.html>; Chris Chester, "Maryland Lawmakers Proposes National Park on the Moon" (9 July 2013), online: <http://wamu.org/news/13/07/09/maryland_lawmaker_proposes_national_park_on_the_moon>.

[306] Leonard David, "Moon Bill Would Create National Park to Protect Apollo Landing Sites" (10 July 2013), online: Space.com <http://www.space.com/21921-moon-bill-protects-apollo-lunar-landings.html>.

[307] *Apollo Lunar Landing Legacy Act*, Sec. 3: "Purposes: (1) to preserve and protect for the benefit of future and current generations the nationality significant historic sites associated with the historical park".

feasible.[308] Hence, the "free use and exploration" of the Outer Space principle set forth in Art. I of the Outer Space Treaty would not be respected.[309]

The Bill followed the recommendations that NASA published in 2011 on "how to protect and preserve the historic and scientific value of U.S. Government lunar artifacts".[310] The recommendations consisted mostly of scientific and technical guidelines and included data on the U.S. equipment that existed on the Moon, at the time.[311] Although they are not binding, they constituted guidelines[312] that revealed the objective of NASA to the "coordination in advance of lunar activities that would impact NASA artifacts of historic and scientific interest to ensure that all appropriate interests are recognized and protected".[313]

The aforementioned attempt of the U.S. to permanently safeguard its presence on the Moon is not relevant to the issue of private property on celestial bodies as such; it discloses, however, the purpose of the U.S. to extend its presence permanently on the Moon. In such a way, the extension of its sovereignty will be more easily questioned on the basis of "title"; title to permanently place and protect the U.S. equipment on the Moon. Should this take place, private ownership on the respective areas could be achievable as allowed through an already established sovereignty that could even lead to an arbitrary colonization of areas of outer space on the basis of domestic law.

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[308] Neta Palkovitz, "A National Park on the Moon: When Moon Court Cases Come to Life" (16 July 2013), online: Leiden Law Blog <http://leidenlawblog.nl/articles/a-national-park-on-the-moon-when-moot-court-cases-come-to-life>.
[309] *Ibid.*
[310] NASA, *NASA's Recommendations to Space-Faring Entities: How to Protect and Preserve the Historic and Scientific Value of U.S. Government Lunar Artifacts* (NASA: 2011), online: NASA <https://www.nasa.gov/sites/default/files/617743main_NASA-USG_LUNAR_HISTORIC_SITES_RevA-508.pdf>, at 6.
[311] *Ibid.*, at 3, 5, 6.
[312] *Ibid.*
[313] *Ibid.*, at 6.

VIII. Conclusions

This chapter discussed the facets that private ownership of celestial bodies can or cannot take. It is a fact that the international legal regime that regulates such issues is not explicit and as such leaves space for various interpretations, narrower or broader. As discussed, the concept of property cannot be applied on areas of outer space in the same way as it is applied on terrestrial areas. The same concept, however, can characterize removable parts of celestial bodies (*i.e.*, their resources), given that the latter is regarded as "fruits" that derive from the use of outer space. The "non-appropriation" principle does not forgive the classic concept of ownership to be acquired by private entities. Outer space is – and will always be – an area of a specific nature, a nature so particular that cannot be treated as if it was a part – or an extension – of Earth. Thus, the approach undertaken throughout this chapter seems to respect both the specific characteristics of outer space as an area beyond sovereignty and appropriation, and the provisions of the *lex spetialis*. Meanwhile it also incentivizes private entities to engage in activities that presuppose legal certainty as to property rights acquisition on celestial bodies. This interpretation allows private space actors to use outer space (as per *usus*), enjoy the benefits of it (as per *fructus*) and dispose the products of space activities (as per *abusus*), satisfying the demands of the currently planned respective private initiatives, specifically *in re* the mining of outer space natural resources.

However, it is important to highlight that the surface and subsurface of the celestial bodies, as parts that belong to outer space *per se* cannot be owned by private entities; they enjoy such immunity that derives from their status as beyond sovereignty and appropriation.

To conclude, while celestial bodies do not differ from the rest of the outer space, their removable parts are considered as products of the use of the former and thus tolerate differentiated

treatment and legal controls. Indeed, "humanity has the stars in its future",[314] only if the interpretation of the rules that frame the use of these stars is made from the perspective of the future needs of the humankind, allowing science fiction to come true without infringing classic values.

[314] Asimov, *supra note* 153.

GENERAL CONCLUSIONS – PROPOSALS FOR THE FUTURE

This thesis attempted an examination of whether private ownership of celestial bodies is legally feasible in light of the general framework that surrounds the issue of property rights in outer space and in light of the very nature of outer space. The analysis adopted revolved around three main axes: the legal nature of outer space, the ambit and interpretation of the "non-appropriation" principle of Art. II of the Outer Space Treaty and the possibility to transfer the classic concept of property to extraterrestrial areas. All three axes share common grounds: the needs that derive from the commercialization of outer space activities.

The thesis found that: outer space is an area beyond national sovereignty and appropriation and can be characterized as *res communis omnium*. This means that outer space can be appropriated neither by governmental nor by private entities. However, outer space must be regarded as a composition of different parts, which are governed somewhat differently. Celestial bodies are one of the parts (different from outer space *per se*) and; so are their natural resources. While both outer space *per se* and the celestial bodies are governed by the two cores of *lex spetialis*, (*i.e.*, the "non-appropriation" and the "non-sovereignty" principles), the natural resources of the celestial bodies escape such characterization since, they may be characterized as the "fruits"[315] (the products) of the celestial bodies. As such, the natural resources of celestial bodies can be harvested by private entities for the "betterment of all mankind" and in such a way that contributes to a terrestrial sustainable development and serves terrestrial needs.

Such exploitation can only take place as a facet of the "use" of outer space and celestial bodies as enshrined in Art. I of the Outer Space Treaty. In other words: although *a priori* establishment of property rights of celestial bodies (both of their surface and the subsurface) is

[315] *Supra note* 118.

prohibited, the ownership of their natural resources comes as a legitimate consequence of the "use" of the celestial bodies. However, the limits of such "use" have to be taken into account. Such limits are delineated through the "freedom of exploration and use of outer space" principle as entailed in Art. I of the Outer Space Treaty. It is clear that the exploitation of natural resources of the celestial bodies by a certain private entity could possibly prevent the simultaneous use of the same natural resources by other entities and thus could result in the infringement of the "freedom of exploration and use" of the same areas. On the other hand, natural resources of the celestial bodies have been proven to be abundant. Thus, the findings of this study can be summarized as follows:

> «Although outer space and the celestial bodies as a whole cannot be appropriated by private entities, ownership on the natural resources of the celestial bodies is legally feasible as a facet of the "use" and exploitation of outer space. However, such use must be undertaken in accordance with the provisions of Articles I and IX of the Outer Space Treaty in such a manner so as to allow other entities (countries) to harvest the products (resources) of the celestial bodies and so that a particular celestial body is not harvested in total, (*i.e.*, it is not destroyed).»

The above findings, coupled with recognition of the need of private companies to commercially exploit outer space may encourage the acceptance of this balanced interpretation. However, the discussion does not end here. The acceptance that the natural resources of celestial bodies can be exploited and harvested by private entities gives rise to a series of subsequent questions: (a) How should the sharing of the harvested resources take place in light of the provisions of the Outer Space Treaty that require a non-discriminatory use[316] of outer space for the benefit and in the interests of all countries and in view of the "equitable sharing" required by the provisions of the Moon Agreement? [317], (b) How ethical is the regulation of the exploitation of

[316] Art I of the Outer Space Treaty: "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, […]".

[317] Art 11, para. 6 of the Moon Agreement: "An equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon, shall be given special consideration."

extraterrestrial resources given the possibility of existence of extraterrestrial life? and, (c) How should new international legal provisions be framed in order to create legal certainty and sufficient protection of the private entities so that investments in relevant space activities flourish?[318].

To answer these questions, the following proposals should be considered: A new international legal instrument should be adopted by the international community to expressly legalize the commercial exploitation of the natural resources of celestial bodies by granting property rights to them.[319] This instrument should introduce an allocation (equitable sharing of benefits) of the natural resources of the celestial bodies in a manner similar to Art. 82 of the UNCLOS according to which, States (and their respectively licensed private entities) can exploit the non-living natural resources of the sea "beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured" by exempting the developing States from such demand.[320] In this manner, the natural resources of the celestial bodies will be exploited on the basis of principles and concepts that already exist in an international document, which is well

[318] John Adolph, "The Recent Boom in Private Space Development and the Necessity of an International Framework Embracing Private Property Rights to Encourage Investment" (2006) 40 Int'l Law. 961 at 975-976.

[319] The drafting of a relevant code of conduct has already been proposed, see, "Private Property in Outer Space: the other Side of the Argument" (13 April 2012), online: Cosmic log <http://cosmiclog.nbcnews.com/_news/2012/04/13/11189692privatepropertyinouterspacetheothersideoftheargument?lite>; however, rules of binding nature should be more effective than "soft" law such as a non-binding code of conduct.

[320] Art. 82 of the UNCLOS:

> "1. The coastal State shall make payments or contributions in kind in respect of the exploitation of the non-living resources of the continental shelf beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured.
> 2. The payments and contributions shall be made annually with respect to all production at a site after the first five years of production at that site. For the sixth year, the rate of payment or contribution shall be 1 per cent of the value or volume of production at the site. The rate shall increase by 1 per cent for each subsequent year until the twelfth year and shall remain at 7 per cent thereafter. Production does not include resources used in connection with exploitation.
> 3. A developing State which is a net importer of a mineral resource produced from its continental shelf is exempt from"

respected by the international community,[321] through prioritizing the "cooperation" and "mutual assistance" principles of space law at the forefront of the provisions.[322]

To conclude, outer space should be used in a peaceful manner[323] and for the betterment of humankind;[324] objectives that are realizable through a legal framework to allow the exploitation of outer space from every possible angle. "Science fiction writers foresee the inevitable, and although problems and catastrophes may be inevitable, solutions are not";[325] hence, time has come for humankind to constitute the protagonist of science fiction and find the way to do so.

[321] Although the Convention has not been signed by the U.S., it enjoys the acceptance of 167 States-part of which 157 are also signatory States; see, United Nations Treaty Collection, online: UN <https://treaties.un.org/Pages/ViewDetailsIII.aspx?src=TREATY&mtdsg_no=XXI-6&chapter=21&Temp=mtdsg3&lang=en>. Even the U.S. has come close to ratifying this convention, when the U.S. President George Bush urged such ratification by the Senate in 2007. The ratification is also prioritized in the agenda of the current president of the Administration of President Barak Obama; see, "Law of the Sea", online: Friends Committee on National Legislation <http://fcnl.org/issues/ppdc/LOS/>.

[322] See the Preamble of the Outer Space Treaty: "[…] *Desiring* to contribute to broad international cooperation in the scientific as well as the legal aspects of the exploration and use of outer space for peaceful purposes, […]", Art. IX of the Outer Space Treaty:

> "In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty."

and the Preamble of the Moon Agreement: "[…] *Determined* to promote on the basis of equality the further development of cooperation among States in the exploration and use of the Moon and other celestial bodies, […]."

[323] See for instance the Preamble of the Outer Space Treaty: "[…] *Recognizing* the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes, […]" and Art. 3 of the Moon Agreement: "The Moon shall be used by all States Parties exclusively for peaceful purposes".

[324] GA Res 1348, *supra note* 8.

[325] Isaac Asimov.

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VIII. MISCELLANEOUS

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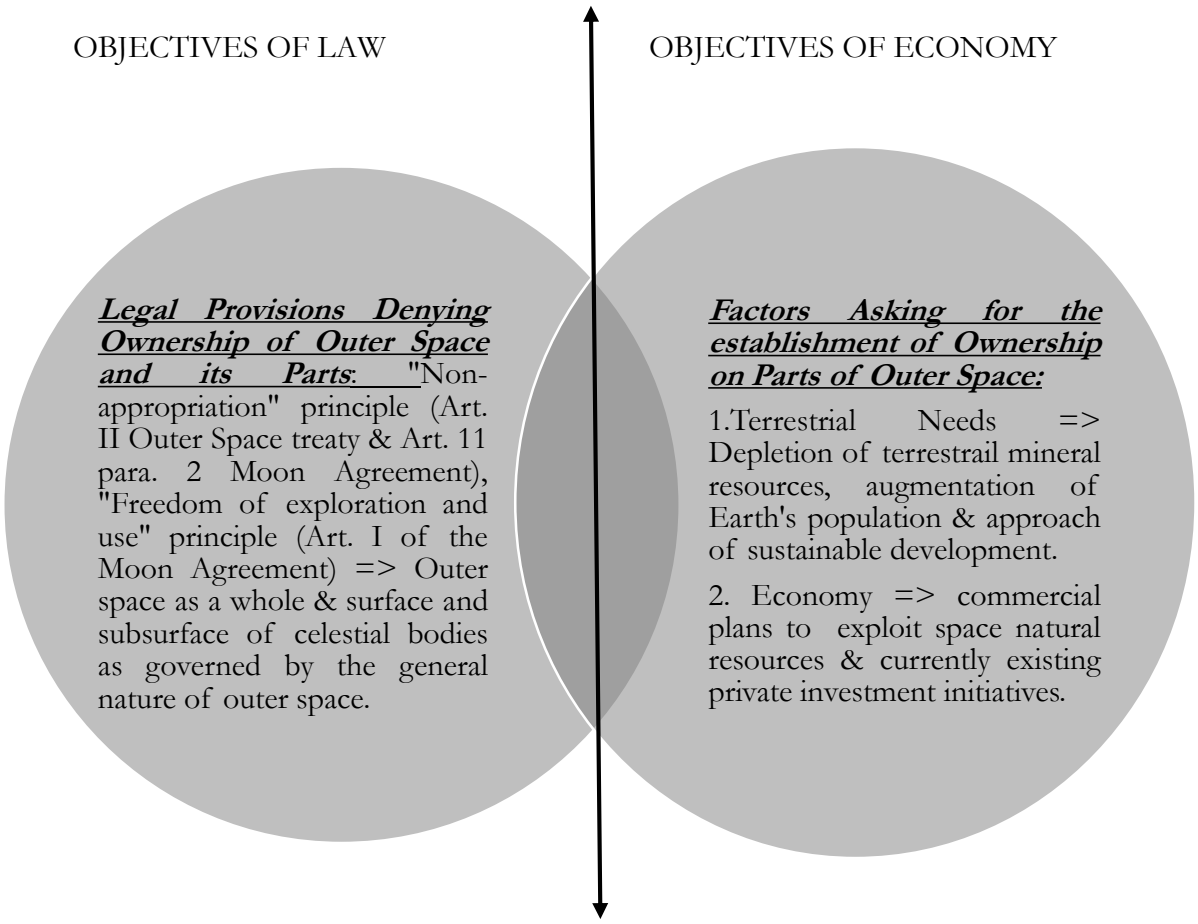
ANNEX

POINT OF INTERACTION



REMOVABLE PARTS OF CELESTIAL BODIES
(*I.e.,* SPACE MINERALS)

- "Fruits" of celestial bodies.
- Limited ownership under conditions:
  - *The celestial body is not totally harvested so that it remains as a part of outer space.*
  - *Other entities are not prevented from equally exploiting the same or other celestial bodies so that Art. I of the Outer Space Treaty is not infringed.*
- Facilitation of market needs.
- Respect to space law.
- Contribution to terrestrial needs and sustainable development.

Ownership on minerals as the "products" of outer space, not on the celestial bodies as parts of outer space.

Art. I, II of the Outer Space Treaty and Art. 11, para. 2 of the Moon Agreement respected if the extraction is regarded as falling within the ambit of "use".