

# The Non-Appropriation Principle: A Roman Interpretation

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## Abstract

The aim of this paper is to analyze the concept of ‘non-appropriation’ in outer space from a legal point of view. The Outer Space Treaty in its Article II provides that outer space, including the Moon and other celestial bodies, is not subject to national appropriation by any means. In the absence of an official interpretation, the precise meaning of this provision has been discussed for decades. This paper will approach the problem by going back to the origin of the concept ‘appropriation’: more than 1500 years ago Roman lawyers had already developed different categories to indicate the relationship between a person and a thing. Ownership and use were the criteria utilized to classify each thing. Over time, these categories evolved and eventually led to the development of ‘property law’. Among them, the concept of *res communes omnium* was elaborated. Its peculiar features will be examined in this paper, underlining the economic function and the multifaceted nature specific of this category of things. *Res communes omnium* are emblematic of how ancient notions can find new life in the regulation of the cosmic dimension. Many of the legal problems faced by the international community today with regard to the cosmic environment are not different from the ones already faced by Roman lawyers when trying to regulate the reality around them. This paper will demonstrate how the ‘non-appropriation’ principle can be interpreted under the light of Roman legal theories. Building upon these findings, the legal status of outer space will be clarified and the scope of application of Article II of the Outer Space Treaty redefined. Roman theories on property rights can offer legal arguments for the use of space resources without breaching the Outer Space Treaty. Underlining the legal feasibility of commercial use of space resources as well as of settlements on other celestial bodies can hopefully represent an incentive for the international community to establish a regime regarding these activities. If that is not achieved, uncertainty will prevail and conflicts are certain to arise.

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## 1. Introduction

When the Roman Empire reached its maximum expansion most of the then-known world was under its jurisdiction. The majority of Europe, North Africa, and Asia Minor were conquered and controlled by Romans. In 117 AD Emperor Trajan<sup>1</sup> ruled over 3.5 million square miles across the globe.<sup>2</sup> “*Roma caput mundi regit orbis frena rotundi*”.<sup>3</sup> Rome, capital of the world, holds the reins of the round globe. With these words the vastness and longevity of Rome’s extraordinary dominion was celebrated. It expressed the idea that the world and the Roman Empire were one. What was outside the territories controlled by Rome, other than the ones populated by so-called barbarians, was considered as an “out-of-the-world” domain. There, the laws of the Empire did not apply. Instead, the principles of *ius gentium*<sup>4</sup> governed its use and exploration: rules whose *rationale* was in the nature of things, shared by all people, notwithstanding time or place.<sup>5</sup> The air, the flowing water of rivers, the seas, and the seashores were part of this realm.<sup>6</sup> They were called: *res communes omnium*.<sup>7</sup>

Today, 1900 years after the time of Emperor Trajan, it is possible to say that the same distinction can be seen between two different domains: planet Earth - our world - and everything surrounding it: outer space. As will be illustrated in this paper, the latter is a *res communis omnium*. The basic principles regulating its use and exploration<sup>8</sup> are, in fact, precisely the ones that the Romans acknowledged for the things “common” to everyone. The *corpus iuris spatialis* was built upon them. All the norms of international law that, in the past sixty years, have regulated specific aspects of space activities - such

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1 D. Wasson, *Trajan*, Ancient History Encyclopedia, 2013, available at: <https://www.ancient.eu/trajan/> (accessed 11.09.2018, as all other websites cited hereafter).

2 W. Duiker & J. Spielvogel, *The Essential World History, Volume I: To 1800*, Cengage Learning, 2017, p. 124.

3 This expression can be found in various sources from the Imperial times of Rome: it is used in *Amores* by the poet Ovidius (I, 15, 25-26); again in *Pharsalia*, by the poet Lucanus (II, 655-656); it appears on Imperial seals at the time of Emperor Charlemagne (IX cent. AD) and Emperor Frederik Redbeard (XII cent. AD).

4 The concept of *ius gentium* can be translated as the “law of peoples”. For a comprehensive analysis of its meaning see: H. Langerlund, *Encyclopedia of Medieval Philosophy: Philosophy Between 500 and 1500*, Volume I, Springer, 2011, p. 223.

5 *Ibid.*

6 *Digesta* 1.8.2.1.

7 *Ibid.*

8 See Articles I and II 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*, Bodies (adopted 27 January 1967, entered into force 10 October 1967); 18 UST 2410, 610 UNTS 205, 6 ILM 386 (1967).

as liability<sup>9</sup> or registration<sup>10</sup> of satellites - have only added elements to that fundamental regime specific to *res communes omnium*, without ever modifying its essence.

This assumption carries with it important implications on the debate regarding space resources. Recent technological progress opened new commercial prospects in the cosmic domain. The past decade has seen a remarkable surge in privately funded initiatives to mine such bodies as the Moon, Mars and, in particular, near-Earth asteroids.<sup>11</sup> However, the legal feasibility of what technology is about to allow depends on the interpretation of the above-mentioned principles, namely: the freedom of use, of exploration and of access to outer space, including the Moon and other celestial bodies, as well as the prohibition of their appropriation.<sup>12</sup> In other words, it depends on the correct reading of the concept: *res communis omnium*. Only when fully understanding what the latter is, can the questions on the future use of outer space be answered.

This paper starts by illustrating the different types of things (*res*), as thoroughly described by Roman jurists, in particular the principles applicable to *res communes omnium*. The discourse then proceeds to demonstrate why outer space is a *res communis omnium* and what practical consequences this has on the use of space resources. From this, it emerges that the key issue is the definition of celestial bodies. Thus, after having analyzed several suggestions advanced so far by different authors, this paper illustrates two possible solutions. This will allow, in the end, to draw some conclusions on the legal feasibility of space resources exploitation.

## 2. The Classification of all Things

### 2.1. The Institutes of Gaius

For centuries the *élite* of the youth of Rome was introduced to the laws of the Empire with a small handbook written by the jurist Gaius in 160 AD.<sup>13</sup>

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9 See *Ibid.* Article VII. See also: *The Convention on International Liability for Damage Caused by Space Objects*, (adopted 29 March 1972, entered into force 1 September 1972); 24 UST 2389, 961 UNTS 187, 10 ILM 965 (1971).

10 See *supra* note 8, Article VIII. See also: *The Convention on Registration of Objects Launched into Outer Space*, (adopted 1 January 1976, entered into force 15 September 1976); 28 UST 695, 1023 UNTS 15, 14 ILM 43 (1975).

11 P. De Man, *Exclusive Use in an Inclusive Environment: The Meaning of the Non-Appropriation Principle for Space Resource Exploitation*, Springer, Zurich, 2016, p. xxiii

12 See *supra* note 8.

13 See A. Berger, *Encyclopedic Dictionary of Roman Law*, The American Philosophical Society, 1953, p. 504.

It was called: *Institutiones Gai*, known today as the Institutes of Gaius.<sup>14</sup> This manual represented a remarkable example of Romans' finesse in legal taxonomy.

A whole chapter was dedicated to the various *res* and was structured as a list of categories through which Gaius classified all things.<sup>15</sup> It began with a distinction between two concepts: the things which are in our patrimony (*res quae in nostro patrimonio sunt*) and the things which are not (*res quae extra nostrum patrimonium habentur*).<sup>16</sup> According to it, a thing would belong to one category or the other depending on the presence of property rights on that thing in a specific moment.<sup>17</sup> Therefore, it can be said that this represented a static classification.

A more dynamic one followed. He called it the *summa divisio* (the great distinction)<sup>18</sup>: there are things that are subject to the laws of men (*res humani iuris*) and things that are subject to divine laws<sup>19</sup> (*res divini iuris*).<sup>20</sup> The former were further divided in public things (*res publicae*), owned by the *populus Romanus* (such as public roads, public lands and State-owned slaves), and private things (*res privatae*), owned by private citizens.<sup>21</sup>

In order to understand if a thing was a *res humani iuris* or a *res divini iuris* one had to look at the possibility for the *res* to be the object of a commercial legal transaction or of property in general. In other words, dealings on the things of divine law were not factually impossible, but prohibited by law.<sup>22</sup> In this sense, the *summa divisio* was similar in many aspects to another famous classification of things that was elaborated after Gaius: all things are either susceptible to be commercialized (*res in commercio*) or not (*res extra*

14 Gaius, *Gai Institutiones*. Available in the original text at: <http://www.thelatinlibrary.com/gaius.html>. (This and every other website cited here have been last accessed in September 2018)

15 Gaius did not use the category of *res communes omnium*. This concept was, in fact, developed between the II and III century AD, just a few decades after his time. However, traces of that idea can be found in his writings. See: *Digesta* 1.8.5 and 41.1.3.1.

16 See Gaius, *supra* note 14, II.1.

17 See V. Scialoja, *Teoria delle proprietà nel diritto romano*, Roma, 1928, Vol. I, p. 123 et seq. and G. Segrè, *Le cose, la proprietà, gli altri diritti reali. Corso di diritto romano*, Torino, 1927, p. 19 et seq.

18 See Gaius, *supra* note 14, II.2.

19 These things were divided in *res sacrae*, dedicated to the gods above (such as temples or sacred groves); *res religiosae*, dedicated to the gods below (such as tombs or burial grounds); and *res sanctae*, things specifically under divine protection (such as the walls and the gates of a city). See: R. Zimmermann, *The Law of Obligations: Roman Foundation of the Civilian Tradition*, Oxford University Press, 1996, p. 241.

20 See Gaius, *supra* note 14, II.2.

21 *Ibid.* II.10 et seq.

22 *Ibid.*, II.2.

*commercio*). Therefore, it can be said that the main criterion on which these distinctions were based was the economic use of the thing.

In sum: all *res divini iuris* were *res extra commercium* and always “not in our patrimony”. As for the *res humani iuris*, they were *res in commercio*, and could be either “in” or “not in our patrimony” depending on their status.<sup>23</sup>

The Institutes represented the foundation for elaborating richer classification of things. The categorizing process continued for centuries after Gaius until, around 530 AD, Emperor Justinian<sup>24</sup> of the Eastern Roman Empire decided to crystallize three hundred years of legal knowledge in the most important collection of Roman laws, principles, and interpretations: the *Corpus Iuris Civilis*.<sup>25</sup>

## 2.2. The Corpus Iuris Civilis

The Corpus Iuris Civilis was divided in four parts.<sup>26</sup> The new classification of things, endorsed by the Emperor, was contained in the part called *Iustiniani Institutiones* (a handbook for legal teachings), based on the legal theories described in the part called *Digesta* (a compilation of the writings of the most eminent Roman jurists): “*Quaedam enim naturali iure communia sunt omnium, quaedam publica, quaedam universitatis, quaedam nullius, pleraque singulorum, quae variis ex causis cuique adquiruntur*”.<sup>27</sup> According to the Latin text, some things are by natural law “common” to everybody, some are public, some *universitatis* (things owned by specific communities, such as theatres or stadiums), some are nobody’s, and the majority of them belongs to private citizens.

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23 Some examples will help clarify these distinctions. Wild animals and abandoned objects were considered out of anyone’s patrimony, but still susceptible to be appropriated by the hunter or finder and thus be the object of dealings (*res in commercio*) (see *Digesta* 41,1,1,1). Public lands - a classic example of *res publica* - were not appropriable by any private citizen as they were owned by the people of Rome (Gaius, *Institutiones Gai* II.1.1). However, they were still susceptible to be the object of certain private property rights, analogous to what we would call today “concessions”. For instance, a private citizen could be authorized to build a villa on public land (*ager publicus*) under the payment of a “rent” (*vectigal*) (see: A. Berger, *supra* note 13, p. 357. See also: *Digesta* 43.8.2.17).

24 See: W. Wyeth, *Justinian I*, Ancient History Encyclopedia, 2012, available at: [https://www.ancient.eu/Justinian\\_I/](https://www.ancient.eu/Justinian_I/).

25 See: M. Cartwright, *Corpus Iuris Civilis*, Ancient history Encyclopedia, 2018, available at: [https://www.ancient.eu/Corpus\\_Juris\\_Civilis/](https://www.ancient.eu/Corpus_Juris_Civilis/).

26 The four parts of the Corpus Iuris Civilis were called *Codex*, *Digesta*, *Iustiniani Institutiones* and *Novellae*. For more information see M. Cartwright, *supra* note 25. For the text of the Corpus Iuris Civilis see: <http://www.thelatinlibrary.com/justinian.html>.

27 *Iustiniani Institutiones* 2,1. See also *Digesta* 1,8,2 and 47,10,13,7.

The classification used in the Justinian text was more elaborated in comparison with the one described by Gaius. All things were divided in five categories depending on their ownership and use. With regard to the first aspect, it can be noticed that *res publicae*, *universitatis* and *privatae* were connoted by the presence of a *dominus* (a concept similar to “owner”). *Res nullius* were nobody’s in their natural state, but had the potentiality to be acquired by anyone who could seize them. Lastly, *res communes omnium* were not owned by anybody and were also incapable to have a *dominus*, being forever considered “out of the patrimony” of men.

As for the aspect of use, the order in which the different categories of *res* were listed was not casual, but indicated a specific progression, from most to least, associated with the “availability” of the *res* to men.<sup>28</sup> Accordingly, every person had the right to access, explore and use *res communes omnium*, while only Roman citizens (*populus Romanus*) were endowed with those rights over *res publicae*. The same rights were granted to an even more limited group with regard to *res universitatis*: the citizens of the communities to which they belonged. As for *res nullius*, they were at the disposal of everybody, but only until somebody appropriated the *res* and, with it, the respective rights. So potentially everyone, eventually just one. Finally, only a single private citizen - the owner – had rights over his *res privata*, excluding by definition everybody else.<sup>29</sup>

Ownership and use separated the five classes of *res* and determined every man’s rights and obligations in relation to the things surrounding him. However, one category encompassed unique elements, distinctive from all the others: the category of *res communes omnium*.

### 3. The Regime and Function of Res Communes Omnium

#### 3.1 Types, Freedoms and Prohibitions

With the Corpus Iuris Civilis, the class of *res communes omnium* was officially adopted in a legislative act. But what was a *res communis omnium*? “*Et quidem naturali iure communia sunt omnium haec: aer et aqua profluens et mare et per hoc litora maris*”.<sup>30</sup> Air, flowing waters (including rain), the seas and because of that the seashores. These were the four things considered “common” to everyone.<sup>31</sup> They all shared the same physical characteristic: *res communes omnium*, by their natural dimension, were not subject to

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28 See, on this point, the analysis conducted by M. Falcon in ‘*Res Communes Omnium*’. *Vicende Storiche e Interesse Attuale di una Categoria Romana*, in I Beni di Interesse Pubblico nell’Esperienza Giuridica Romana, 2016, p. 114 et seq.

29 *Ibid.*

30 See *supra* note 27.

31 For a comprehensive view on the regime and function of *res communes omnium* see the work of D. Dursi, *Res Communes Omnium*, Jovene ed., Naples, 2017.

acquisition ‘*tout court*’ by men, not even through collective entities, not even by the powerful Roman Empire<sup>32</sup> (the seashores - which in theory could fall out of this logic - belonged to this category only “*per hoc*”, meaning only because they were indispensable to access and use the seas<sup>33</sup>).

Therefore, a specific category was created with a specific regime. Three principles described the possible utilization of these *res*: 1) freedom of access 2) freedom of use and 3) prohibition to appropriate them.

“*Nemo igitur ad litus maris accedere prohibetur*”.<sup>34</sup> Access to the seashore – and consequently to the sea - could not be prohibited to anyone. The same could be said for the air and the flowing waters of rivers.<sup>35</sup> Thus, every man was allowed to put himself in the position to dispose of *res communes omnium*, freely.

The freedom of access was followed by the multi-faceted freedom of use. “*Maris communem usum omnibus hominibus, ut aeris; et quidem mare omnium commune est et litora, sicuti aer*”.<sup>36</sup> Every man had the right to utilize these things: to breathe air, to walk on the seashores and to sail the seas.<sup>37</sup> At the same time, this freedom included the exploitation of the resources thereof: fishing, hunting birds and taking pebbles or other rocks found on the beach.<sup>38</sup> Furthermore, the Romans recognized as part of the free-use principle the possibility to build certain constructions on the seashores as well as in the sea (such as beach huts, where fishermen could rest and dry their nets, or pile-dwelling buildings used to access more easily waters rich of fishes).<sup>39</sup> These structures were connected to those exploiting activities. Therefore, not only they had to allow others to still use the *res communis omnium*, they also had to be temporary.<sup>40</sup> Thus, when removed – either by the owner or by some natural event - the place could again become available to everyone.

As for the prohibition to appropriate, this was connected to the practical impossibility for a man to become *dominus* of a whole *res communis*. However, property rights were accepted on constructions and on resources, because the object of those rights was never the *res communis omnium*

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32 See M. Falcon, *supra* note 28, p. 108.

33 *Ibid.* p. 118.

34 *Iustiniani Institutiones* 2.1.2. And also *Digesta* 1.8.4.

35 *Digesta* 47.10.13.7.

36 *Digesta* 43.8.1.

37 See G. Grosso, *Corso di Diritto Romano. Le Cose*, in *Rivista di Diritto Romano*, LED Ed., 2001, p. 32. For the Latin text see: *Digesta* 1.8.4, 1.8.5.1 and 43.8.3.1; *Iustiniani Institutiones*. 2.1.1 and 2.1.5.

38 See D. Dursi, *supra* note 31, p. 41 et seq. For the latin text see: *Iustiniani Institutiones* 2.1.3, 2.1.7 and 2.1.9. *Digesta* 1.8.3, 1.8.4, 41.1.3.1 and 47.10.13.7.

39 *Ibid.* p. 65 et seq.

40 See M. Falcon, *supra* note 28, p. 125 et seq.

itself.<sup>41</sup> This distinction between the object of property rights and the object of the non-appropriation principle was a fundamental concept for the class of *res communes omnium*.

### 3.2 Two Things in One

All things “common” to everybody were structured as a complex category, made of two things in one. The first one – the “container” - was the physical domain at large: the air, the flowing waters, the seas and, as a consequence, the seashores. The second one – the “content” – was the set of all things that could be found in that domain, such as birds in the air, fish in the sea or pebbles on the seashore. Thus, if the container was regulated by the principles described above, the content was, on the other hand, considered a *res nullius*, out of anyone’s patrimony (in its natural state), but susceptible to be appropriated once seized.<sup>42</sup>

The *rationale* of this dichotomy (container/content) was connected to the function of the category *res communes omnium*. From the analysis conducted so far, it emerges clearly that it was not for solidaristic reasons that certain things were acknowledged as *communes omnium*. It was because those domains were essential for the survival of ancient societies. Fishing, hunting, sailing, were all critical activities on which the economy of every village and city was based. That is why the physical domain in which those activities were conducted could not be restricted from the common use through appropriation (not even from the public power) and it is why the things that were contained in them had to be appropriable (*res nullius*). In other words, the category *res communes omnium* was created with an economic function, based on the free exploitation of the resources contained in the “common”

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41 On the problem of ownership regarding constructions over *res communes omnium* see: D. Dursi, *supra* note 31, p. 65 et seq. See also: M. Fiorentini, *L’Acqua da Bene Economico a “Res Communis Omnium” a Bene Collettivo*, in *Analisi Giuridica dell’Economia*, 2010, p. 49 et seq.

42 The separation between the “container” and the “content” emerges clearly from various sources of Roman law. The list and regime of things considered *communes omnium* has already been mentioned before (see *infra* §.III). Regarding the regime of the “content” and its *res nullius* nature see: *Iustiniani Institutiones* 2.1.12. See also Gaius in *Digesta* 41.1.1.1 and 41.1.7.3; Paulus in *Digesta* 41.2.1.1, and Florentinus in *Digesta* 1.8.3. A thorough analysis of this distinction is offered by D. Dursi, *supra* note 31, p. 60 et seq. One example - used by numerous Roman jurists - is worth mentioning: “*Insula quae in mari nascitur (quod raro accidit) occupantis fit: nullius enim esse creditur*” (*Digesta* 47.1.7.3). According to the text, an island formed in the sea is appropriable by occupation, being in fact a *res nullius*. “Island” is to be understood as the agglomeration of material by an external force (the water) that results in the creation of an autonomous body in the surrounding environment. This resembles noticeably the idea of asteroids or even bigger celestial bodies formed by gravitational forces in outer space. This point will be further developed in the next section.



*res*.<sup>43</sup> Thus, this product of Romans' juridical brilliance shaped the ancient world, and, nowadays, sheds a light of clarity on some of the thorniest problems of space law.

#### 4. Outer Space *Communis Omnium*

##### 4.1 The Legal Status of Outer Space: Rationale and Regime

The launch of satellite Sputnik-1 by the USSR<sup>44</sup> in 1957 opened the doors of the Universe to humankind. Already in the first years of space exploration the great prospects of the extra-atmospheric domain were becoming clear<sup>45</sup>: it was not only the new frontier to explore and conquer, it was also an environment that offered revolutionary opportunities for our society. Military and civil applications of space assets, eventually, changed our way of living and became essential for our economies. These opportunities induced the international community, in the 1960s, to set down the basic principles applicable to outer space. The so-called Outer Space Treaty<sup>46</sup> (hereinafter: OST), adopted in 1967, established the regime for the use and exploration of outer space.

Its first two Articles represent the pillars of space law, establishing the legal status of the cosmic realm. Article I of the OST declares the four fundamental freedoms of space law:

*“Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States ... and there shall be free access to all areas of celestial bodies. There shall be freedom of scientific investigation”*.<sup>47</sup>

Article II, OST follows with the core prohibition regarding the cosmic domain:

*“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”*.<sup>48</sup>

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43 On the economic function of the category *res communes omnium* see: D. Dursi, *supra* note 31.

44 Sputnik-1 was the first man-made object to orbit Earth. For more information see S. Garber, *Sputnik and the Dawn of the Space Age*, available at: <https://history.nasa.gov/sputnik/>.

45 This can be seen in the *Aeronautics and Space Reports of the President* by the National Aeronautics and Space Council (available at: <https://history.nasa.gov/presrep.html>) or in NASA space policy documents (available at: <https://history.nasa.gov/spdocs.html>). See also *Outer Space: Prospects for man and Society*, edited by L. Bloomfield for American Assembly, Columbia University Prentice-hall, 1962. Of great interest for this topic - even if written in the 1970s - is the *Long Term Prospects for Developments in Space (A Scenario Approach)*, Hudson Institute, 1977, by W. Brown and H. Kahn.

46 See *supra* note 8.

47 *Ibid.* Article I.

48 *Ibid.* Article II.

Thus, ownership and use are described here. Outer space is nobody's and nobody can ever appropriate it, or become *dominus* of it, 'tout court'. That is true not only by law, but also from a physical perspective: no State can exercise sovereign powers over the entire infinite Universe.<sup>49</sup> At the same time, the right to access, explore, use, and investigate outer space belongs to every member of the international community.<sup>50</sup>

From the analysis in sections I-III, it emerges that the same aspects that defined *res communes omnium* in Roman law can be found in the regime of space law as well as the same practical reason for the application of this category and the same *rationale* behind the recognition of specific rules for this "common" thing. Therefore, it has to be recognized that outer space is a *res communis omnium*.<sup>51</sup> Its legal status resembles the one envisaged in the Justinian's Corpus Iuris Civilis for the many *res* "common" to all. Thus, if the Emperor of the Roman Empire had to classify the cosmic domain in its categorization of things, he would define it firstly as a thing out of the patrimony of men (*res quae extra nostrum patrimonium sunt*); secondly, he would add that it must be a *res extra commercium*, since no legal transactions can be concluded over it and its celestial bodies; finally, he would say that is not a *res publica* – because is not owned by any *populus* – but it certainly is a *res communis omnium*: so essential to humanity that it must always remain nobody's and at the disposal of all.

In conclusion, the legal status attributed to outer space derives from economic evaluations, mostly connected to the crucial value of the *res* for all humans. At this point, it is necessary to examine the implications of this acknowledgement on the thorniest economic issue of space law: the use of space resources.

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49 As for the Moon and other celestial bodies this aspect will be addressed *infra* at §V.1

50 The subjective scope of application of Article I is "all States", not only "States Parties to the Treaty" (expression used elsewhere in the OST when the subject of certain rights and obligations is more limited). Moreover, these two articles are considered customary law applicable to States irrespective of their ratification of the OST as well explained - among others - by C. Christol, *The Jus Cogens Principle and International Space Law*, Proceedings of the 26th Colloquium on the Law of Outer Space, Springer, Wien, 1984, p. 1 et seq. and by F. Tronchetti, *The Non-Appropriation Principle Under Attack: Using Article II of the Outer Space Treaty in its Defence*, Proceedings of the 50th Colloquium of the Law of Outer Space, Springer, Wien, 2008, p. 526 et seq.

51 The recognition of outer space as *res communis omnium* can be found abundantly in literature. See for all: C. Christol, *Space Law - Past, Present and Future*, Kluwer, Boston, 1991.

## 5. Legal Feasibility of Space Resources Utilization

### 5.1 Outer Space and Celestial Bodies from the Eyes of a Roman Jurist

As has been shown in the previous sections, the things “common” to everyone are a complex category made of two distinctive concepts: a “container” and a “content”, one non-appropriable, the other *res nullius*. What does that mean in relation to outer space? What is, there, the “container” and what the “content”?

It may help to consider the cosmic environment from the perspective of a Roman jurist. The void in which stars, planets and other celestial bodies float, or outer space at large, would be to his eyes the “container”. On the other hand, each and every “body” floating in space would be the “content”. In fact, outer space would be to him like the sea: infinite, essential, non-appropriable. While celestial bodies like islands naturally formed in it (*insula in mare nata*)<sup>52</sup>: *res nullius*, freely usable, appropriable by occupation. It would be his opinion that any State could conquer the Moon or Mars or asteroids by the same means by which they would appropriate newly discovered lands on Earth.

However, as compelling as he may sound, his position would not be received well today by the international community. Celestial bodies and outer void space cannot be separated on the basis of their appropriable nature pursuant to the principle established in Article II, OST.<sup>53</sup> Therefore, they both should be considered as “containers”. But what is, then, the “content” in this cosmic *res communis omnium*? The solution to this conundrum revolves around the question: what is a celestial body?

### 5.2 The Scientific Definition of “Celestial Body”

The OST, as the whole *corpus iuris spatialis*, uses special categories - such as “celestial body” - that have very ambiguous legal definitions or no legal definition at all.<sup>54</sup> Therefore, the answer to the above question must be found somewhere else.

It is, once again, from the Roman world that a first hint on the definition of celestial body can be found. The adjective “celestial” comes from the Latin word *caelum* (sky). Building upon this etymology, the expression “celestial bodies” is used, nowadays, to indicate all the bodies that can be detected in the sky beyond the atmospheric envelope of the Earth.<sup>55</sup> Easy examples are the Moon, the Sun and some planets of our Solar System.

These bodies, however, can be very different in size and properties. The term “body” is, in fact, very expansive. In physics, a “body” is defined as mass

52 On this analogy see *supra* at note 42.

53 See Treaty on Principles *supra* note 8, Article II.

54 See P. De Man, *supra* note 11, p. 48.

55 O. Ogunbanwo, *International Law and Outer Space Activities*, Martinus Nijhoff, The Hague, 1975, p. 60.

that distinguishes itself from the surrounding environment.<sup>56</sup> Consequently, any distinctive “massive”<sup>57</sup> object beyond Earth’s atmosphere is a celestial body. If we accept this definition, not only planets and stars would be considered as such, but also all other things having detectable mass. Dwarf planets, asteroids, splinters of rocks and even dust could fall within this definition. As a result, the non-appropriation principle would have an extremely broad scope of application that I believe would hardly be accepted by the international community today. This definition would affect activities already in place<sup>58</sup> and it would go against the views of many spacefaring nations.<sup>59</sup>

Using scientific definitions to interpret norms of space law creates more problems than it solves. Therefore, it is necessary to explore this dilemma from a different perspective: is it possible that some celestial bodies escape the non-appropriation principle, being in fact not celestial bodies in the legal sense?<sup>60</sup>

### 5.3 Three Legal Theories on the Meaning of “Celestial Body”

In 1964 the Working Group III of the International Institute of Space Law (IISL) drafted a resolution<sup>61</sup> that defined celestial bodies as all “natural objects in outer space that cannot be artificially moved from their natural orbits”.<sup>62</sup> Accordingly, if a spaceship interferes with a celestial body provoking an orbital alteration, the latter shall not be legally regarded as such anymore. However, considering that methods to deflect objects travelling in our Solar System are already available (e.g. asteroid impact avoidance techniques)<sup>63</sup>, a nation wanting to appropriate a celestial body would simply have to apply those methods to the designated target in order to cause movement. As a result, the cosmic object, technically affected in its natural orbit, would not be anymore a celestial body by definition. This solution leaves the door open to a scenario that would negate the purpose of

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56 See P. De Man, *supra* note 11, p. 116.

57 Intended as an object with detectable mass.

58 Examples of this are the extraction of Moon rocks by US Apollo 11 astronauts and by Soviets with the probe Luna in 1970. Those samples of rocks were then brought back to Earth.

59 See the U.S. Commercial Space Launch Competitiveness Act, 51 USC 10101, 25 November 2015, Title IV. See also the Luxembourg Law on the Exploration and Use of Space Resources, No. 674, 20 July 2017. See finally the IISL Position Paper on Space Resources Mining, adopted on 20 December 2015.

60 V. Pop, *Who Owns the Moon?*, Springer, Berlin, 2009, p. 48.

61 The resolution was never adopted, but it can still be read in the Proceedings of the 7th Colloquium on the Law of Outer Space, Springer, Wien, 1964, p. 351-354.

62 *Ibid.*

63 See D. Mazanek, *Comet/Asteroid Protection System: Concept Study Executive Summary*, available at <https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20050186565.pdf>.

Article II, OST itself, allowing the appropriation of an expansive number of objects beyond the atmosphere.

No more accuracy comes from another solution based on some characteristics of celestial bodies that can be deduced from Articles I and XII of the OST. The former establishes that there shall be free access to all areas of celestial bodies.<sup>64</sup> The latter talks about stations and installations on celestial bodies.<sup>65</sup> As a result, one cannot consider a small piece of rock as a celestial body insofar as it is not viewed primarily as an area permitting landing.<sup>66</sup> If this theory eliminates the problem of the appropriable nature of the smallest objects, it does so by connecting the solution to the technical capability of humans to access or build things on celestial bodies. In other words, the construction of scaled-down installations or the landing of centimeters-long robots on small asteroids will expand the definition in the future, creating legal uncertainty. This is the reason why legal definitions should not be made dependent on a set of criteria that can be neutralized due to their origins in a technical area in full development.<sup>67</sup>

A third and final interpretation of the expression “celestial body” is built upon the following assumption: considering that none of the UN space treaties allows for a differentiation between large and small celestial bodies in the context of the principle of non-appropriation, one has to simply interpret the notion as referring to all bodies, irrespective of size or mass.<sup>68</sup> This solution seems to finally end the discussion by adopting an all-inclusive criterion. However, it opens the door to a much bigger problem: the legal feasibility of space resources appropriation.

There are two possible solutions to this problem. One option is to say that the exploitation of space resources is simply not allowed because it entails the appropriation of portions of celestial bodies, hence falling within the prohibition of Article II, OST (for the old principle: *plus semper in se continet quod est minus*). It follows that no “use” that entails the consumption of the thing will be legally permitted. In the end, this would simply mean the impossibility for man to ever colonize the Universe without depending on Earth’s resources. This would dramatically hinder humanity’s expansion in the cosmos.

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64 See *supra* note 8, Article I.

65 *Ibid.* Article XII.

66 See V. Pop, *supra* note 60, p. 53.

67 M. Markoff, *Traité de Droit International Public de l’Espace*, Edition Universitaire Fribourg Suisse, Fribourg, 1973, p. 243.

68 This opinion is expressed in S. Hobe, R. Jakhu, S. Freeland, F. Tronchetti, & P. Stubbe, *The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, in *Cologne Commentary on Space Law*. Vol. II, Carl Heymanns Verlag, Cologne, 2013, p. 325 et seq.

A different option is to say that resources are indeed exploitable, being something different (by extraction) from the celestial body itself.<sup>69</sup> This unlocks the possibility to utilize space resources, but what happens when this “use” entails the full disruption of the resource? Consider the example of a small asteroid that is mined until it is completely consumed. In this case, the utilization of the celestial body’s resources is, in practice, equal to the appropriation of the celestial body itself. Therefore, such activity shall be considered a breach of Article II, OST. Since the appropriation of celestial bodies is not allowed, permitting the appropriation of the resources extracted, would only shift the problem: when is a celestial body disrupted by man’s intervention? Where to draw the line? There is no answer to this question, because when all bodies beyond Earth’s atmosphere are legally considered celestial bodies, the utilization of space resources is either unfeasible or uncertain.

In conclusion, it appears that the various answers to the original question “what is a celestial body?” are not satisfactory. There is apparently no theory beyond reproach. Perhaps, the solution is to be found not looking at science or at the status of space resources, but using an instrument more familiar to jurists: a conventional definition.

## 6. The List and the Line

### 6.1 199 Res Communes Omnium

In our Solar System there are 8 planets with 185 natural satellites, 5 dwarf planets and 1 star.<sup>70</sup> It is possible to imagine that moons and planets were the main concern of the OST drafters when they decided to refuse sovereignty beyond the atmosphere. This remains today the main reason why the non-appropriation principle is considered so crucial: the idea of the Moon or Mars as property of a nation or a private party is unacceptable.

One possible way to safeguard those extra-atmospheric things historically deemed “sacred” to men - as their nomenclature suggests - is to create a list. It should contain all 199 above-mentioned cosmic *res*, indicated by their official names as known today. Only these things will be legally considered as celestial bodies and, accordingly, will be given the legal status of *res communes omnium*. The value of the list will be in the certainty and clarity of the instrument: if, for scientific reasons, the status of a planet will be changed (as it happened to Pluto), this will not affect the list. Its content, in

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69 On this position see: F. Tronchetti, *The Exploitation of natural resources of the Moon and Other Celestial Bodies*, Martinus Nijhoff Publishers, Leiden, 2009, p. 193 et seq. See also U.S. *supra* note 59.

70 See the IAU official position as presented at: <https://www.iau.org/public/themes/pluto/>. For the number of natural satellites see: <https://solarsystem.nasa.gov/moons/in-depth/>.

fact, will be made of the official names used to indicate precisely each celestial body, irrespective of their status or definition. Therefore, this solution is not technically hard to put in place. The biggest obstacle comes from the political will to adopt a binding international document, either in the form of a treaty or in the form of an annex to the OST.<sup>71</sup> However, for as straightforward as a list can be, it is not the only conventional solution adoptable by the international community without depending on science or on the status of space resources.

## 6.2 The Vesta Line

It is not the first time in the history of man that a limit has to be found between what does and what does not belong to a certain legal regime.

In 1702, Cornelis van Bynkershoek<sup>72</sup> in its “*De Dominio Maris Dessertatio*” put to rest a longstanding discussion regarding the limit of territorial waters.<sup>73</sup> There was a necessity to delimit the part of the sea where coastal States could exercise their jurisdiction. Therefore, van Bynkershoek came up with a very empiric solution: the range of a cannon shot.<sup>74</sup> However, considering that cannons had different ranges, in 1782 the Italian economist Ferdinando Galiani<sup>75</sup> proposed a fixed conventional limit of 3 nautical miles (based on the assumption that, at that time, it represented the average range of a cannon).<sup>76</sup> This remained for centuries (despite the opposition of some States) the generally accepted limit of territorial waters.

More recently, an international debate arose on a similar problem: the demarcation between air space and outer space.<sup>77</sup> These two domains, subject to different legal frameworks, needed a “border” in order to determine the rules applicable to spaceships flying through air and conducting suborbital flights. In the complexity of finding a definitive answer, Theodore von

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71 It has to be acknowledged that this solution seems hardly feasible in today’s international scenario, given the reluctance from all States Parties to the OST to modify this document.

72 For more information see *Cornelis van Bynkershoek*, in *Encyclopaedia Britannica*, available at: <https://www.britannica.com/biography/Cornelis-van-Bynkershoek>

73 See H. Wright, *De Dominio Maris Dissertatio*, in *The American Journal of International Law*, Vol. 18, Issue 4, 1924, p. 850 et seq.

74 This was based on the old Roman principle: “*Terrae potestas finitur ubi finitur armorum vis*”.

75 For more information see *Ferdinando Galiani*, in *Encyclopaedia Britannica*, available at: <https://www.britannica.com/biography/Ferdinando-Galiani>

76 See T. Scovazzi, *The Evolution of International Law of the Sea: New Issues, New Challenges*, in *Recueil Des Cours: Collected Courses of the Hague Academy of International Law*, Martinus Nijhoff Publishers, The Hague, 2000, p. 72.

77 See A. Soucek, *Space Law Essentials - Volume 1: Textbook*, NWV Verlag GmbH, Wien, 2016, p. 20.

Karman<sup>78</sup> in his “*The Wind and Beyond*” came up with a very practical solution based on the idea that air space ends where the physical laws regulating flight change.<sup>79</sup> That happens at an altitude between 80 and 100 km. Therefore, he proposed to have the conventional edge of space at 100 km above Earth’s sea level. Many entities of the international community, nowadays, have embraced this solution.<sup>80</sup>

The common denominator of these two conventional solutions was that they were inspired by the main activity to be performed in that domain, or, in other words, by the reason why a limit was needed at that particular moment. For territorial water, the use of force; for outer space, the capability to launch spaceships.

When it comes to celestial bodies, the main activity - and the main reason why a definition is needed - is their exploitation. It is possible, then, to distinguish between celestial bodies in the legal sense (*res communes omnium*) and all the other extra-atmospheric things (*res nullius*). The conventional limit can be at 550 km diameter, which is the size - rounded up - of the biggest asteroid (*rectius*: “small Solar System object”) known today in our Solar System: Vesta. Only cosmic objects above that dimension will be legally “celestial bodies” (determining the application of the relative regime).

Why Vesta? From a very empirical perspective, the diameter of Vesta is approximately 530 km, which is almost half the size of the smallest dwarf planet in the Solar System: Ceres. This way, there is no risk of inexplicably leaving out of the definition very similar celestial bodies. Moreover, the biggest market prospected in the Universe is asteroid mining and, at the same time, asteroids are the celestial bodies that pose more problems when trying to apply the non-appropriation principle (given the possibility to find them in extremely small sizes and to consume them completely through exploitation). Therefore, there will be no regulatory hurdles connected to property rights, opening the doors to all the resources essential for the sustainability of interplanetary expansion. Finally, this limit will protect all the celestial bodies (planets, dwarf planets, the Sun, and the biggest natural satellites) that, for size and significance to humanity, better fit the *res communes omnium* regime. From this, it becomes reasonable to say that the use of resources on the Moon or on other planets after extraction is allowed (as suggested in the

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78 For more information see *Theodore von Karman*, in Encyclopaedia Britannica, available at: <https://www.britannica.com/biography/Theodore-von-Karman>.

79 T. von Karman, L. Edson, *The Wind and Beyond: Theodore Von Kármán, Pioneer in Aviation and Pathfinder in Space*, Little, Brown, New York, 1967, p. 343.

80 Australia with the 2002 amendment to the “Australian Space Activities Act of 21 December 1998” has set the boundary of outer space at an altitude of 100 km (art. 8). The Karman line is also used by the F.A.I., the International Air Sports Federation and the US Aeronautic Association. Many other States, in their national laws, refer to space as what is beyond the atmosphere, thus implicitly recognizing that space is where the laws of aerodynamics do not apply anymore.



last theory illustrated in section V.3), considering them the “content” (*res nullius*) of the celestial body (*res communis omnium*).

## 7. Conclusion

The international community has discussed for years how to converge in one harmonized system the freedom to use space resources and the non-appropriation principle of Article II, OST. Different arguments have been used, unsuccessfully, to find a solution. This paper suggests a new approach: examining the core principles of space law under the light of Roman law, origin of the legal status of outer space.

Standing on the shoulders of the “giants of the past”, outer space appears as a complex *res* made of a “container” and a “content”. Because of Article II, OST, the distinction between these two aspects can only come from a conventional solution, revolving around the definition of celestial bodies.

A conventional definition of “celestial body”, as suggested in this paper, will bring certainty to many grey zones of space law connected to the expansion of humans in the Solar System. Either a list of names or a fixed size can determine which extra-terrestrial bodies should be considered legally celestial bodies. Only the latter will be protected from appropriation, allowing at the same time the free appropriation of their resources, once extracted.

Thus, the system of space law will be coherent within itself: the non-appropriation principle safeguarded as well as celestial bodies clearly defined, the legal status of outer space respected and the economic *rationale* of *res communes omnium* appreciated.