Where Law Meets Cinema

James Cameron's Avatar *as Food for Thought about the Anthropocentric Nature of Space Law*

*George D. Kyriakopoulos**

Abstract

James Cameron's *Avatar* is a 2009 science fiction film about a paraplegic marine who participates in a military mission of colonization and exploitation of the moon Pandora of a planet in the constellation of Alpha Centauri. The mission's main purpose is the extraction of the precious mineral unobtanium. The film's hero, Jake, will come close to the native Na'vi tribe, which lives in harmony with Nature and resists human colonization. Jake will approach and mix with the Na'vis by remotely driving a genetically engineered body. When human forces attempt a military strike, Jake chooses to side with the natives in order to help them to protect the natural environment of Pandora and repel the human attempt to destroy the planet's ecosystem in order to promote commercial exploitation. The interest of the film lies in the acceptance that Mankind has an unlimited right to populate planets with intelligent life in terms reminiscent of the Colonial Era: Imposition of the technologically advanced, plunder of colony's resources, violation of the rights of indigenous populations and environmental degradation in the name of commercial priorities. However, what is more interesting is an attempt to apply international law to the mythological context of *Avatar*: UNGA Resolutions 1803(XVII) and 1514(XV) provide that all peoples not only have the right to self-determination but they also have "permanent sovereignty" over their natural resources. Nevertheless, international law is not automatically extended to extraterrestrial creatures. A similar *lacuna* exists regarding the implementation of space law in this case: Although Article IX OST provides that States shall avoid "harmful contamination" during space exploration, the obligation of States to conduct activities in outer space "with due regard to the corresponding interests of all other States" (Articles I, IX OST) obviously does not refer to alien indigenous populations. The same is true with Article II OST, as the non-appropriation principle makes sense only between "nations". It appears that International and Outer Space Law have significant *lacunae* with respect to the protection of alien ecosystems and life forms – deficiencies that could be remedied through an enlarged perception of planetary protection. This approach emphasizes the special ethical status of extraterrestrial life – at least at the level of intentions, despite the absence of regulatory provisions. It follows that outer space exploration requires a coherent set of rules in order to face systematically the aforementioned challenges. The current status of this research will be the object of this paper.

* National and Kapodistrian University of Athens, Greece, yokygr@gmail.com.

an·thro·po·cen·tric \ ˌan(t)-thrə-pə-ˈsen-trik\ : considering human beings as the most significant entity of the universe[1]

James Cameron's *Avatar* is a 2009 science fiction film about a paraplegic marine who participates in a military mission of colonization and exploitation of the moon Pandora of a planet in the constellation of Alpha Centauri. The mission's main purpose is the extraction of a precious mineral called unobtanium. *Avatar* premiere was in London on December 10, 2009, while its international release was on December 16 of the same year. The film was highly appraised for its visual effects and is considered to present as the highest-grossing film of all time. It should also be mentioned that *Avatar* was nominated for nine Academy Awards and finally won three of them: for Best Art Direction, for Best Cinematography and for Best Visual Effects.[2]

I. The Plot

The film's hero, Jake, a man of the mission, will come close to the native Na'vi tribe, which lives in harmony with Nature and resists human colonization. Jake will approach the Na'vis by remotely driving a genetically engineered body, which allows him to mix with the natives. Through this involvement, Jake will be initiated into the philosophy of the Na'vis and become a partaker of their deep relationship with Nature. When human forces attempt a military strike, Jake chooses to side with the natives in order to help them to protect the natural environment of Pandora and repel the human attempt to destroy the planet's ecosystem in order to promote commercial exploitation.

II. Assessment

The film's central theme is that, sometime in the future, Mankind is guided by a philosophy of unlimited exploitation of planets with (inferior) intelligent life-forms, in terms reminiscent of the Colonial Era: Imposition of the technologically advanced, plunder of extraterrestrial colony's resources, violation of the rights of indigenous populations and environmental degradation in the name of commercial priorities.

At the same time, however, the film is a hymn to the harmonious coexistence with the Natural Environment in compliance with its laws. This dimension of the film leads to two different directions: on one hand, it constitutes a message for today's human beings, who not only have become alienated from Mother Nature, but they systematically cause damage to It; on the other

1 www.merriam-webster.com/dictionary/anthropocentric.

2 See www.the-numbers.com/movie/Avatar#tab=news (last visited on 24.9.2015) as well as www.imdb.com/title/tt0499549/awards (last visited on 24.9.2015).

hand, it invites us to ask ourselves whether there are specific principles as well as a prevailing philosophy under which Mankind is preparing for the long journey to the Stars, which essentially has only just begun. Despite the actual trend in space activities towards the commercialization of "near Earth space", exploration of outer space remains of paramount importance.
Consequently, the concept of *Avatar* describes the conflict between:

– an unrestricted exploitation of natural resources of a planet having also, in addition to a diverse natural ecosystem, intelligent life-forms (Na'vi), by a technologically superior race (in this case, the human race at an indefinite time in the future);
– the protection of the natural resources on this planet by indigenous people, who live in harmony with the natural environment (now threatened by the invaders).

Under this scheme, the *Avatar*'s challenges for space law (IV) particularly emphasize planetary exploration as an indispensable foundation for the systematic use of outer space, which is not currently the case (III).

III. Exploration v. Exploitation, Exploitation through Exploration

It is well known that the main issues in space law from the outset were the "exploration" and the "use" of Outer Space. At the time of the inception of the space treaties, and especially the Outer Space Treaty (OST),[3] it seemed that both concepts were balanced and equally important. One could argue that the expectations of Mankind at that time were mainly focused on space exploration rather than on use and exploitation. It is not by accident that, at that time, the preferred theme in science fiction novels was the so-called "deep space" and the "space travel".[4] All these expectations culminated in the landing of Apollo 11 on the Moon in 1969.[5]
These expectations for space "exploration" and "use" were further reflected in space law: According to the Preamble of the OST, which in fact reiterated General Assembly Resolution 1962 of 1963, said treaty was

3 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, adopted on 19 December 1966, opened for signature on 27 January 1967, entered into force on 10 October 1967, 610/U.N.T.S./205 (hereinafter "Outer Space Treaty" or "OST").

4 […] as, for instance: Poul Anderson, *Tau Zero;* Frank Herbert, *Dune;* Isaac Asimov, *Foundation;* Arthur C. Clarke, *Rendezvous with Rama;* Robert A. Heinlein, *Starship Troopers;* or the *Star Wars* (original) trilogy and the *Star Trek* saga.

5 As Manfred Lachs pointed out, "[…] outer space is one of the big chapters of man's activities which shows its potentialities. Man entered into it driven by an inborn urge for adventure and greater control of nature" – "Some Reflections on the State of the Law of Outer Space", *J.S.L.*, vol. 9, Nos 1 & 2, 1981, p. 10.

> "Inspired *by the great prospects opening up before mankind as a result of man's entry into outer space*, *Recognizing the common interest of all mankind in the progress of the exploration* and use of outer space for peaceful purposes,[6] AND Believing that the exploration and use of outer space should be carried on for the benefit of all peoples irrespective of the degree of their economic or scientific development".[7]

Furthermore, Article I of the OST provided that "Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind", while Article V imposed on States to "regard astronauts as envoys of mankind in outer space and [...] render to them all possible assistance in the event of accident". Along the same line, according to Article IX, States Parties to the Treaty should pursue studies of outer space, including the Moon and other celestial bodies, and *conduct exploration of them* so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extra-terrestrial matter and, where necessary, shall adopt appropriate measures for this purpose".
What lies in the heart of these regulations is merely the thirst of Humanity for space exploration, for the ultimate Quest, for the Great Adventure – rather than the "use".[8] In any case, even if one were to assume that the motives of outer space exploration (in fact, of ANY exploration) is the economic exploitation of new discoveries, the spirit of the OST provisions mentioned fits well with the admiration of Mankind to the infinity of the Universe, which, back to the 1950s and the 1960s, constituted a fascinating challenge for the International Community.[9]
What followed was not what was expected. Almost 50 years after the landing on the Moon and the first lunar steps of Neil Armstrong, Mankind is still absent from the Moon. The same is also true for Mars, a planet so beloved in science fiction novels. Of course there were robotic missions on Mars, important scientific discoveries such as latest for the existence of liquid water on

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6 See S. Hobe & N. Hedman, "Preamble", *in* S. Hobe, B. Schmidt-Tedd, K.-U. Schrogl & G. Meishan Goh (eds.), *Cologne Commentary on Space Law*, Vol. 1 Outer Space Treaty, Carl Heymanns Verlag, 2009, p. 21.

7 Cf. UNGA Resolution 1348 of 13 December 1958 establishing the ad hoc Committee on the Peaceful Uses of Outer Space, stressing, *inter alia*, the desire of the international community "*to promote energetically the fullest exploration* and exploitation of outer space for the benefit of mankind", "conscious that 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*" – text of the resolution *in* www.unoosa.org/pdf/gares/ARES_13_1348E.pdf. It should be also noted that in the wording of the General Assembly resolutions of that time "exploration" is always mentioned before "use".

8 For the timeless human dreams for space exploration, See Manfred Lachs, "Some Reflections…", *op. cit.,* p. 3.

9 As Lachs mentions, "First was the question of entry into outer space; second the status of it; and third the activities within outer space" – *op. cit.*, p. 7.

the surface of the Red Planet, the Voyager missions in order to study the outer Solar System, as well as a lot of other unmanned missions in order to study the celestial bodies in our planetary system – for instance NASA's New Horizons probe flew past Pluto recently, towards another target.[10] However, NASA's share of the federal budget has dropped dramatically since the space-race heyday of the 1960s, although the United States still regard space exploration as a key priority, according to recent declarations of the deputy chief of the Agency.[11]

So, in sharp contrast with the increased involvement of the private sector in many "space use" applications, it has to be admitted that outer space *exploration* has stalled. And, obviously, this happens because there are insufficient funds for it.

Why explore space? Of course it is a very expensive activity, between the fuel costs and the technological challenge of operating in a hostile environment.

However, there are concrete benefits in space exploration. Perhaps the most direct benefit comes from the fact that technologies used today on Earth were first pioneered in space exploration. It seems also that exploration could give a boost to new jobs, as each space agency would be in the constant need of contractors, universities and other entities in order to implement its exploration programs. Last but not at all least, space exploration might prove a necessity for the survival of Mankind. As Stephen Hawking has recently pointed out, "we are entering an increasingly dangerous period of our history" as "our population and our use of the planet resources are growing exponentially". For this reason, "our only chance of long term survival is not to remain inward looking on planet Earth *but to spread out into space*".[12] In another interview in the *El País* journal, Hawking insisted on the same issue, stating that "I think the survival of the human race will depend on *its ability to find new homes elsewhere in the universe*, because there's an increasing risk that a disaster will destroy Earth. I therefore want to raise public awareness about the importance of space flight".[13]

Obviously Hawking highlights two main reasons why Mankind should explore the stars: The exhaustion of natural resources of the Earth, relative to population growth, and the risk of occurrence of fatal disasters on our planet.

It is worth noting what NASA mentions with respect to space exploration:

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10 For details, See https://www.nasa.gov/mission_pages/newhorizons/main/index.html (last visited on 15 January 2016).

11 See Mike Wall, "Space Exploration Still US Priority, NASA Says", www.space.com/19743-space-exploration-priority-nasa.html (Last visited on 15 January 2016).

12 From an interview of Stephen Hawking. See www.space.com/8924-stephen-hawking-humanity-won-survive-leaving-earth.html (last visited on 15 January 2016).

13 http://elpais.com/elpais/2015/09/25/inenglish/.1443171082_956639.html (Last visited on 15 January 2016).

> "Humanity's interest in the heavens has been universal and enduring. Humans are driven to explore the unknown, discover new worlds, push the boundaries of our scientific and technical limits, and then push further. The intangible desire to explore and challenge the boundaries of what we know and where we have been has provided benefits to our society for centuries.
> Human space exploration helps to address fundamental questions about our place in the Universe and the history of our solar system. Through addressing the challenges related to human space exploration we expand technology, create new industries, and help to foster a peaceful connection with other nations. Curiosity and exploration are vital to the human spirit and accepting the challenge of going deeper into space will invite the citizens of the world today and the generations of tomorrow to join NASA on this exciting journey."[14]

It seems that at present the international community is mainly concerned with the challenge of initiating activities of space *exploitation* – in other words with the *stricto sensu* use of outer space and not with space exploration. Several important legal issues are associated with this new reality. The thorniest question in this regard is whether positive space law can adequately regulate the strongly emerging private activities aimed at the economic exploitation of celestial bodies.[15] Space law has been expressed so far in broad, vague principles that have permitted the maximum flexibility necessary for exploratory space activities.[16] Nevertheless, law, in general, is not immutable

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14 NASA, "Why we explore", *in* www.nasa.gov/exploration/whyweexplore/why_we_explore_main.html#.VqU3nzaAXOg (last visited on 15 January 2016).

15 See for information: R.J. Lee, *Law and Regulation of Commercial Mining of Minerals in Outer Space*, Springer, 2012, 372 p.; Z. Meyer, "Private Commercialization of Space in an International Regime: A Proposal for a Space District", *Northwestern J.I.L.&B.*, Vol. 30 Issue 1, 2010, p. 241-261; S. Hobe, "The Impact of New Developments on International Space Law (New Actors, Commercialization, Privatization, Increase in the Number of "Space-faring Nations"), *Uniform Law Review*, 2010, Vol. 15, issue 3-4, p. 869-881; F. Tronchetti, *The Exploitation of National Resources of the Moon and Other Celestial Bodies*, Nijhoff, 2009, 320 p.; J.L. Zell, "Putting a Mine on the Moon: Creating an International Authority to Regulate Mining Rights in Outer Space", *Minnesota J.I.L.,* vol. 15, 2006, p. 489-519; R. Jakhu, "Twenty Years of the Moon Agreement: Space Law Challenges for Returning to the Moon", *Z.L.W.*, vol. 54, 2005, p. 243-260; W. White, "The Legal Regime for Private Activities in Outer Space", paper presented at "Space: The Free Market Frontier", 15 March 2001, in www.spacefuture.com/archive/the_legal_regime_for_private_activities_in_outer_space.shtml (last visited on 15 January 2016); K.M. Zullo, "The Need to Clarify the Status of Property Rights in International Space Law", *Georgetown L.J.,* vol. 90. 2001-2002, p. 2413-2444.

16 As Bueckling rightly observed, "time and again it becomes apparent how difficult it is to provide adequately phrased rules for, and to systematize in legal language the extremely complicated subject matter created by the technological explorations in outer space and the resulting multitude of conflicting interest" – Adrian Bueckling, "The Strategy of Semantics and the 'Mankind Provisions' of the Space Treaty", *J.S.L.*, vol. 7 no 1, 1979, p. 17. For the same issue, See Heidi Keefe, "Making the Final Frontier

but responds to the needs of society. As exploration has given way to exploitation and as this – predominantly international – law lacks the specificity and legal certainty necessary for mature commercial activity, sooner or later law will follow the international community needs in outer space.

Anyway, every systematic effort of exploitation of natural resources in outer space will likewise sooner or later require a corresponding promotion of space exploration. Otherwise, the scope for commercial exploitation will remain narrow, essentially limited to a few suborbital recreational activities as well as mining activities on near-Earth celestial objects (NEOs). Add to this the parameter of Earth's overpopulation with its environmental implications and the need to seriously tackle the prospect of space exploration follows effortlessly. All roads lead to the Stars, regardless of the existing difficulties (*Per aspera ad astra*).[17]

IV. Applying International Space Law to *Avatar's* Challenges: The Anthropocentric Article I Ost

As far as space law is concerned, this debate becomes particularly interesting, as it provides us with the challenge to reflect on the adequacy of the existing rules and regulations in providing a solid answer for this particular concern – space exploration.

However, what is more interesting is an attempt to apply international law to the mythological context of *Avatar*.

From the perspective of general international law, UNGA Resolution 1803(XVII, in conjunction with Resolution 1514(XV), provides that all peoples not only have the right to self-determination but they also have "permanent sovereignty" over their natural resources. Nevertheless, international law is applicable among States, therefore its application is not automatically extended to extraterrestrial creatures. Further, a similar *lacuna* also exists regarding the implementation of the Law of Outer Space in this case: Although Article IX of the OST provides that States shall avoid "harmful contamination" during space exploration, the obligation of States to conduct activities in outer space "with due regard to the corresponding interests of all other States" (Articles I, IX OST) obviously does not refer to alien indigenous populations. The same is true with Article II OST, whereby outer space is not subject to national appropriation, as this concept makes sense only between "nations".

Under the present approach, it seems that the most disturbing provision is Article I of the OST, according to which "The exploration and use of outer

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Feasible: A Critical Look at the Current Body of Outer Space Law", *Santa Clara High Technology Law Journal*, Vol. 11 Issue 2, 1995, p. 346.

17 Kurt Vonnegut, *The Sirens of Titan* (1959).

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*". Moreover, same article provides that "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". The Moon Agreement of 1979[18] is along the same line: Article 11 declares the Moon and its natural resources as "*the common heritage of Mankind*", whereas, pursuant to Article 4, "The exploration and use of the Moon *shall be the province of all mankind* and shall be carried out for the benefit and in the interests of all countries".

Space law doctrine has repeatedly stressed the importance of these articles, though always with respect to relations among (earth) states in outer space. However, if one considers the impact of these provisions in the specific context of the relationship of human beings to extra-terrestrial life forms, said provisions acquire a completely different meaning.

It should be recognized that the perception of the Universe as "a province of mankind" *involves intense anthropocentrism*, if seen in the context of a planetary exploration process. It seems that Manfred Lachs had considered this kind of approach as inevitable, as he had noted that

> "space is 'outer' in relation to the small planet called earth. In fact, it is the universe – minus our globe, or perhaps minus a small, narrow band of the air space surrounding it. Thus in building a law for the universe minus our globe we are relying on an anthropocentric approach. In all domains and so in law-making this anthropocentrism is the result of our special capacities [...]".[19]

The term "Mankind" in the space treaties has been interpreted variously, according to the different viewpoints of scholars over time about the degree of collectiveness this term expresses.[20] What is more, it could serve as a pretext for all those who would opt for an unrestricted, "wild" exploitation of natural resources of outer space, in other words an exploitation which would not be subject to any rules except that of profit.

This anthropocentrism is somewhat tempered by Article IX of the OST. Said article is the only hard law provision to rely upon, as it sets some standards in order to mitigate contamination of the celestial bodies from human missions (*forward contamination*) or contamination of the Earth by the introduction of extra-terrestrial matter (*backward contamination*). Thus, *Article*

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18 *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, adopted on 5 December 1979, opened for signature on 18 December 1979, entered into force on 11 July 1984, 1363/U.N.T.S./3 (hereinafter "Moon Agreement").

19 Lachs, "Some Reflections…", *op. cit.*, p. 6.

20 See Bueckling, *op. cit.*, p. 18-19.

IX is the only legal provision so far that moves, to a certain extent, away from the anthropocentric logic of the space law in force, as it could serve as the legal "basis for the environmental protection of outer space" from human intervention.[21] Furthermore, Article 7 par. 1 of the Moon Agreement constitutes an advanced version of the same principle, as it gives priority to the forward protection of the Lunar environment, by stating that

> "In exploring and using the Moon, States Parties shall take measures to prevent the disruption of the existing balance of its environment, whether by introducing adverse changes in that environment, by its harmful contamination through the introduction of extra-environmental matter or otherwise".[22]

In this context, the *Galileo* case should be mentioned: said spacecraft plunged into Jupiter's atmosphere on 21 September 2003, thus being deliberately destroyed in order to protect a possible ocean beneath the icy crust of the moon (of Jupiter) Europa.[23]

As such, and in the absence of sufficient positive law provisions which would ensure the safeguard of extra-terrestrial natural ecosystems and the protection of existing life forms, intelligent or not – with the exception, of course, of Article IX of the OST –, a Universe – "province of Mankind" is a legal construction that could give rise to a version of space exploitation similar to the one of the colonial past of the Earth.[24]

It appears, then, that International and Outer Space Law, being profoundly anthropocentric, have significant *lacunae* in matters of protection of extra-terrestrial environments and alien life forms. Besides, special attention must be given to the term "celestial body", while we are still in research of a comprehensive legal regime applicable to these astronomical objects.[25] It is also important to bear in mind that, according to Article 1 par. 1 of the Moon Agreement, "the provisions [...] relating to the Moon shall also apply to other celestial bodies *within the solar system*, [...] except insofar as specific legal norms enter into force with respect to any of these celestial bodies". However, this clarification does not affect the anthropocentric nature of the aforemen-

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21 S. Marchisio, "Article IX", *in* S. Hobe, B. Schmidt-Tedd, K.-U. Schrogl & G. Meishan Goh (eds.), *Cologne Commentary on Space Law*, Vol. 1 Outer Space Treaty, Carl Heymanns Verlag, 2009, p. 176.

22 See Marchisio, "Article IX", *op. cit.*, p. 177.

23 http://solarsystem.nasa.gov/galileo/; Marchisio, *op. cit.*, p. 179.

24 Cf. Bueckling observing that "the very notion of heritage, taken in relation to the concept of mankind, marks the birth of an ancient human norm" – *op. cit.*, p. 21. For the same author, the concept of 'Mankind', for the time being, "does not represent a workable legal term" – *op. cit.*, p. 22.

25 Carl Q. Christol, "The Moon and Mars Missions: Can International Law Meet the Challenge?", *J.S.L.*, Vol. 19 No 2, 1991, p. 132.

tioned provisions, in the light, of course, of the basic instrument in space law, which is the OST.

V. The Concept of Planetary Protection v. Anthropocentrism

Article IX OST constitutes the major legal source of the concept of planetary protection.

> "Planetary protection aims to prevent biological contamination of both the celestial body (object of mission) and the Earth. The need for such a protection is based on the human experience from the past: During the Spanish exploration of the Americas by the *conquistadores*, the smallpox virus they carried killed thousands of indigenous people [...]"

NASA defines Planetary Protection (PP) as "the term given to the practice of protecting solar system bodies (*i.e.*, planets, moons, comets, and asteroids) from contamination by Earth life, and protecting Earth from possible life forms that may be returned from other solar system bodies".[26] The Agency admits that its policy regarding PP "is aligned with the COSPAR Planetary Protection Policy, and is consistent with Article IX of the 'Outer Space Treaty'".
According to NASA's Office for Planetary Protection, PP

> "is essential for several important reasons: to preserve our ability to study other worlds as they exist in their natural states; to avoid contamination that would obscure our ability to find life elsewhere – if it exists; and to ensure that we take prudent precautions to protect Earth's biosphere in case it does. Typically, planetary protection is divided into two major components: *forward contamination*, which refers to the biological contamination of explored solar system bodies; and *backward (*or *back) contamination*, which refers to the biological contamination of Earth as a result of returned extraterrestrial samples".[27]

Regarding said contamination, NASA Policy Directive NPD 8020.7G "Biological Contamination Control for Outbound and Inbound Planetary Spacecraft (Revalidated 05/17/13 w/change 1)" provides that

> "The conduct of scientific investigations of possible extraterrestrial life forms, precursors, and remnants must not be jeopardized. In addition, the Earth must be protected from the potential hazard posed by extraterrestrial matter carried by a spacecraft returning from another planet or other extraterrestrial sources. Therefore, for certain space-mission/target-planet combinations, controls on organic and biological contamination carried by spacecraft shall be imposed in accordance with directives implementing this policy".[28]

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26 http://planetaryprotection.nasa.gov/overview.
27 http://planetaryprotection.nasa.gov/overview (last visited on 15 January 2016).
28 Text in http://planetaryprotection.nasa.gov/overview.

In this respect, NASA's Procedural Requirements NPR 8020.12D "Planetary Protection Provisions for Robotic Extraterrestrial Missions", adopted in compliance with NPD 8020.7G, makes a categorization of such missions in order to assure an adequate Planetary Protection.

Table 1. Mission Planetary Protection Categories*

Planetary Target Priority	Mission Type	Mission PP Category
Not of direct interest for understanding the process of chemical evolution or where exploration will not be jeopardized by terrestrial contamination. No protection of such planets is warranted, and no requirements are imposed.	Any	I
Of significant interest relative to the process of chemical evolution but only a remote chance that contamination by spacecraft could compromise future investigations.	Any	II
Of significant interest relative to the process of chemical evolution and/or the origin of life and for which scientific opinion provides a significant chance that contamination by spacecraft could compromise future investigations.	Flyby, Orbiter	III
Of significant interest relative to the process of chemical evolution and/or the origin of life and for which scientific opinion provides a significant chance that contamination by spacecraft could compromise future investigations.	Lander, Probe	IV
Any Solar System Mission	All Earth Return	V Unrestricted Earth Return Restricted Earth Return

* Text in http://planetaryprotection.nasa.gov/overview.

As described in NPR 8020.12D, missions must meet a certain set of forward contamination criteria including:

- Limiting the probability that a planetary body will be contaminated during the period of exploration to no more than 1×10^{-3} (unless otherwise specified), where the period of exploration shall extend at least 50 years after a Category III or IV mission arrives at its protected target (and no longer than the time point after which no organisms remain viable on the spacecraft);
- Avoiding impact of Mars over a time period of 50 years with a probability of $< 1\times10^{-2}$ for spacecraft the cross the orbit of Mars *en route* to other targets, and $< 1\times10^{-4}$ for all launch elements that leave Earth's orbit;

- Avoiding impact of target bodies, including orbital lifetime constraints; and
- Minimizing contamination through mission-dependent pre- and post-launch approaches such as cleanroom usage, aseptic assembly of spacecraft, partial sterilization of spacecraft components, and trajectory biasing.

Careful mission design and planning are essential to meeting these conditions.[29] A further safeguard is currently provided by the PP (Planetary Protection) Principles of COSPAR,[30] which has concerned itself with questions of biological contamination and spaceflight since its very inception. Said principles are elaborated in the context of Article IX of the OST, which (as previously mentioned), for the time being, constitutes the only positive provision dealing with environmental protection of planetary ecosystems (under the scheme "forward contamination" – "backward contamination"). For instance, regarding human missions to Mars, a specific COSPAR guideline provides that "a comprehensive planetary protection protocol for human missions should be developed that encompasses both forward and backward contamination concerns, and addresses the combined human and robotic aspects of the mission, including subsurface exploration, sample handling, and the return of the samples and crew to Earth".[31] COSPAR recommendations depend on the type of space mission and the celestial body explored. However, the works of COSPAR constitute soft law provisions and do not create specific obligations for the space faring States.

Specific reference must be made to COSPAR's Panel on Exploration (PEX), which is a body that investigates a stepwise approach of preparatory research on Earth and in Low Earth Orbit (LEO), in order to facilitate a future global space exploration program. It has to be mentioned that, in March 2011, said panel organized a workshop, in cooperation with the European Science Foundation (ESF) and the COSPAR Panel on Planetary Protection (PPP), entitled "International Earth-based research program as a stepping stone for global space exploration – Earth-X". The focus of the workshop was on an

29 http://planetaryprotection.nasa.gov/missiondesign/.

30 The Committee on Space Research (COSPAR) is a Scientific Committee of the International Council of Science (ICSU). COSPAR represents national science institutions from 45 member countries, 13 international and scientific unions and 5 associated companies – See P. Ehrenfreund, C.P. McKay & the COSPAR Panel on Exploration (PEX), "Activities of the COSPAR Panel on Exploration supporting the Global Exploration Roadmap" (Report), *Space Policy*, Vol. 30, 2014, *in* www.elsevier.com /locate/spacepol (last visited on 15 January 2016).

31 Expanding Options for Implementing Planetary Protection During Human Space Exploration and Robotic Precursor Missions, Interim Report, PRE Coordinating Group – Planetary Protection Sub Group, For Heads of Space Agencies Summit on Planetary Robotic and Human Spaceflight Exploration, Washington D.C., January, 2014, p. 2.

international program "that pursues compelling science goals and prepares for future robotic and human exploration of Earth, Moon, and Mars and other space exploration targets".[32]

Regardless of how important it is, planetary protection is primarily intended to protect the integrity of an alien environment for the purposes of scientific research as well as to protect the Earth from possible contamination of extraterrestrial origin. It is therefore evident that only partial relevance presents to what could be described as a real "code of ethics" for the approach and contact with alien natural environments and life forms.

An important step in the right direction was the COSPAR Workshop on Ethical Considerations for Planetary Protection in Space Exploration, convened at Princeton University on June 8-10, 2010. The task of said workshop was to examine whether planetary protection measures and practices should be extended to protect planetary environments within an ethical framework that goes beyond 'science protection' *per se*.[33] A set of recommendations developed during the workshop addressed the need for a revised policy framework to address ''harmful contamination'' beyond biological contamination, noting that it is important to maintain the current COSPAR planetary protection policy for scientific exploration and activities.[34]

In particular, Recommendation No 4 mentions that "COSPAR should consider that the appropriate protection of potential indigenous extraterrestrial life shall include *avoiding the harmful contamination of any habitable environment* – whether extant or foreseeable – within the maximum potential time of viability of any terrestrial organisms (including microbial spores) that may be introduced into that environment by human or robotic activity" (emphasis ours).[35]

Furthermore, Recommendation No 5

> "acknowledges that
> – life, including extraterrestrial life, has special ethical status and deserves appropriate respect because it has both intrinsic and instrumental values, and
> – non-living things, including extraterrestrial things, likewise have value and deserve respect appropriate to their instrumental, aesthetic, or other value to human or extraterrestrial life (emphasis ours)".[36]

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32 Ehrenfreund et al., op. cit.

33 See J.D. Rummel, M.S. Race, G. Horneck and the Princeton Workshop Participants, 'Ethical Considerations for Planetary Protection in Space Exploration: A Workshop", *Astrobiology*, Vol. 12, No 11, 2012, *in* www.ncbi.nlm.nih.gov/pmc/articles/PMC3698687/ (last visited on 15 January 2016).

34 Idem.

35 Ibid.

36 Ibid.

Said recommendation also considered that "Inherent in the conduct of scientific, exploration, and other activities – whether by robotic or human missions – is the need to consider and appropriately protect potential extraterrestrial life".[37]
Although they are not non-binding, these recommendations pave the way for a more comprehensive approach to planetary protection, with strong ethical characteristics, which significantly reflects the artistic anxieties of the *Avatar* movie.

VI. Some Conclusions

The question is: Did the journey to outer space make us wiser?[38] The answer depends on the degree of anthropocentrism that we intend to tolerate in outer space law.
As far as the prohibition of planetary contamination is concerned, it has been rightly argued that Article IX OST constitutes an emerging customary rule of international space law.[39] Nevertheless, this is not enough: Outer space exploration requires a coherent set of rules in order to face systematically the challenges posed by planetary exploration and the subsequent exploitation/colonization. Beyond contamination mitigation, the COSPAR recommendations related to the special ethical status of extraterrestrial life constitute a significant progress, at least at the level of intentions, despite the absence of regulatory provisions.
Of course, it is always possible that Mankind, during its space adventure, will meet alien races far more advanced than us humans, but with similar legal perceptions about the Universe ("province-like").[40] In such a case, it is

37 Cf. the *Star Trek*'s Prime Directive, aimed at preventing interference with the internal development of civilizations that are less technologically advanced: "No identification of self or mission; no interference with the social development of said planet; no references to space, other worlds, or advanced civilizations" – See for information J.D. Stemwedel, "The Philosophy Of Star Trek: Is The Prime Directive Ethical?", 20 August 2015, *in* www.forbes.com/sites/janetstemwedel/2015/08/20/the-philosophy-of-star-trek-is-the-prime-directive-ethical/#3b2f795b642b (Last visited on 15 January 2016).

38 See Lachs, *op. cit.*, p. 5.

39 See Marchisio, *op. cit.,* p. 181.

40 Professor Susan Schneider of the University of Connecticut believes that most intelligent alien civilizations will tend to be forms of superintelligence. In order to support her conclusion, she offers three observations: 1. *The short window observation*. Once a society creates the technology that could put them in touch with the cosmos, they are only a few hundred years away from changing their own paradigm from biology to AI; 2. *The greater age of alien civilizations*. Proponents of SETI have often concluded that alien civilizations could be much older than our own; 3. *Extraterrestrial civilisations would likely be SAI* (superintelligent AI), because silicon is a superior medium for superintelligence. – Susan Schneider, *Alien Minds* (for a NASA symposium in astrobiology), forthcoming in *Discovery*, Stephen Dick (ed.), Cambridge University Press, also *in*

obvious that an analysis like the one presented here would be completely worthless.[41, 42]

http://schneiderwebsite.com/Susan_Schneiders_Website/Research.html (last visited on 15 January 2016).

41 As Stephen Hawking stressed in an interview in the Spanish journal *El País* (25.09.2015), "If aliens visit us, the outcome could be much like when Columbus landed in America, which didn't turn out well for the Native Americans. Such advanced aliens would perhaps become nomads, looking to conquer and colonize whatever planets they can reach. To my mathematical brain, the numbers alone make thinking about aliens perfectly rational. The real challenge is to work out what aliens might actually be like" – http://elpais.com/elpais/2015/09/25/inenglish/1443171082_956639.html (Last visited on 15 January 2016).

42 These are uncharted waters for the human race, as "When it comes to imagining ETIL who might be superior to us in intelligence, it is difficult to imagine what superior intelligence would manifest that is beyond the very human intelligence that is doing the imagining" – C. Impey, A.H. Spitz & W. Stoeger (eds.), *Encountering Life in the Universe – Ethical Foundations and Social Implications of Astrobiology*, Un. of Arizona Press, 2013, p. 214.