Ethical Implications of the Colonization, Privatization and Commercialization of Outer Space

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Abstract

This research paper examines the unfolding ethical issues regarding space colonization, privatization and commercialization. It looks at the uneven burdens of risk and issues of justice as fairness concerning countries with relatively low-income who cannot fully participate or participate at all in the space rush because they lack the expertise and resources. The paper reveals that during the space rush, uneven burdens of risks may result in certain undesirable social-economic effects for people leaving in low income countries where communities and individuals are asymmetrically unsheltered from hazards.

Regarding justice as fairness, this paper finds that the prospects of privatizing and commodifying space raise the need for clarity on space ownership, accessibility, accountability and ability or inability to participate arising for low-income countries, especially since the 1967 Outer Space Treaty which declares space as belonging to the commons is only persuasive and not binding. These findings leads to the conclusion that just as it happened on Earth, space developments could be driven by morally lacking and behaviorally detrimental models of conquest if premised on the dogma that orchestrated European genocide to indigenous lives across the world for the past millenia; however, ethical frameworks such as global utilitarian, Kantian ethics and non-anthropocentric value ethics may hopefully be necessary to help ward off imperialism if they can be adopted for space developments.

Introduction

Outer space is no doubt the next frontier for colonization, privatization and commodification by humans. This is shown by the growing space activities carried out by numerous national space agencies and private companies (Poponak, 1-3). Increased accessibility is radically transforming the competitive landscape in space as it is becoming more evident that until recently, only a few private companies and countries were wealthy enough to invest in space-based assets (Poponak, 1-3). But in the contemporary era, lower launch costs and the availability of low-cost small satellites are establishing opportunities for new commercial, military, and scientific ventures (Poponak, 1-3). As Mark Williamson surmises;

> The construction of the International Space Station in low earth orbit (LEO) and the formulation of plans to search for life on Mars [and Saturn's moon] indicate that humans are intent on making the space environment part of its domain (49).

Ray A. Williamson agrees, stating that "in extending our scientific intelligence so far, it extends our psyches well into the realm we once reserved for the gods" (256). There is even growing zeal in the plausibility of terraforming a planetary body (Mars especially) or planetary ecosynthesis.[1] This year's initiation of SpaceX's Falcon heavy rocket into deep space has bolstered and motivated the visions of new space ventures (Carrington, 29-30). As a private entity, SpaceX has moved its way into the space industry, an area which has for decades been

[1] Planetary Ecosynthesis: the process of introducing a succession of ecosystems to a terraformed planet. Terraforming is the process of applying global engineering techniques to transform the climate of a planet into one that is habitable for terrestrial organisms. It entails a purposeful alteration of another planetary environment to improve the chances of survival of an indigenous biology or, in the absence of any native life-forms, to allow for habitation of most, if not all, terrestrial life-forms.

under the control of national space agencies like the National Aeronautics and Space Administration (NASA) and main contractors such as Lockheed Martin and Boeing (Carrington, 29-30). Also in the competition is Amazon billionaire Jeff Bezos, who landed a reusable rocket through his own company, Blue Origin (Carrington, 29-30). Courting controversy, Elon Musk, the CEO of SpaceX has gone to the extent of making contentious suggestions that scientists must start thinking of "nuking Mars" to warm and prepare it for future terraforming and human habitation (Genovese, 1-10). An interesting addition to the space industry landscape is the aerospace company, Sierra Nevada, which is planning to engage in an interplanetary transport system where they will deliver space cargo in the near future while another new player, Bigelow Aerospace, has a vision of space tourism in which tourists will be paying to visit its space station and staying overnight in a hotel in space (Carrington, 29-30). A nongovernmental organization (The Center for the Advancement of Science in Space) is currently venturing in commercial science for space stations (Carrington, 29-30).

Critics of space colonization and privatization such as Taylor Genovese, in his journal article *The new right stuff: Social imaginaries of outer space and the capitalist accumulation of the cosmos*, points out that space colonization is alluring to capitalists' expansion in their interest to shift the future experiences of outer space affairs by moving away from peaceful scientific exploration to privatize commercial exploitation because of the rich space resources (Genovese, 1-10). This has engendered the mushrooming of private space corporations (1-10). Genovese argues that the sudden surge of interest by private companies in space developments is induced by the growing neoliberal capitalism within the Global North (1-10). His views are that new space companies currently hold multi-billion-dollar contracts with governmental space agencies;

therefore, they are ambitious to readily conform to neoliberal economics (Genovese, 1-10). Genovese contends that these private companies and billionaires are not bothered by the fact that the philosophical approaches they are using in the current space developments are similar to colonial conceptions of the individual, limited governance, unchecked resource extraction, and frontier mentalities (Genovese, 1-10). For example, the fact that private companies want to colonize Mars for commercial reasons mimics what European colonizers did in the past; land grab by false hood without thoughtfulness for indigenous life they found living in those territories (Genovese, 1-10). From a development theory perspective, colonial conception of space development could potentially render economies in space to become specialized in raw materials-extraction sites (Halperin, 1-20). This approach is feared could likely foster a distorted structure that impedes ethical developments in Space (Halperin, 1-20). Once colonialism is accomplished in Space, market forces will work to perpetrate the relationship of dominance and exploitation between earth industries and Space colonies (Halperin, 1-20). These new hegemonic economic phenomena in space ventures are not being met yet by strong resistance from the public asking for a more ethical human future in outer space that is equitable, decolonized, and democratic (Halperin, 1-20). For example, it is still not known yet whether there is life in Mars and other planets such as Saturn's moon; therefore, suggestions such as nuking Mars to warm it for terraforming and human habitation purposes as private space company owner, Elon Musk has called for are worrisome (Genovese, 1-10).

Science and Technology Breakthroughs

Scientific break-through and human vision have made it possible for humans to explore interstellar space, with robotic rovers investigating Martian impact craters, sending back information and live pictures (Carrington, 29-30). It is also now common knowledge as derived from images obtained through the Hubble telescope and earth-based observatories, that the universe has many habitable worlds which have no remotely detectable signs of life (Sheshpari et al, 1-13, Davies, p.8-8, Lissauer, 1-6 and Cockell, 1-15). These include planets in our own galaxy and planets orbiting distant stars also known as exoplanets (Cockell, 1-15). Researches show that habitable planets are now being frequently discovered elsewhere in the Universe; however, there are many speculative scenarios in which the search for life on them could yield negative results in the sense of not revealing anything (Sheshpari et al, 1-13, Davies, 8, Lissauer, 1-6 and Cockell, 1-15). In the past few years, more than 20 earth-like planets have been discovered in orbit around stars other than our Sun; these are 'extrasolar' planets (Sheshpari et al, 1-13, Davies, 8, Lissauer, 1-6 and Cockell, 1-15).

Space technology scholar, Sheshpari, observes that this knowledge inspires some ideas that humans can inhabit these planets in future, beginning with nearest ones and later advancing to far planets (1-13). She argues that the possibility of this happening increases as science and technology make breakthroughs for humans to adapt to new environments and conditions in other planets (Sheshpari et al, 1-13). Currently, there are more projects underway for Mars colonization. The main one known being the Mars One project which is under development by a Netherlands based company (Sheshpari, 1-13). As Sheshpari notes, scientists envision space colonies as having the potential to prolong the survival of the human species on the notion that

even if our current Earth planet ultimately is rendered uninhabitable or if humans could be in danger on Earth due to unpredictable natural and man-made disasters in future, there is the likelihood that human beings may move to other planets (Sheshpari et al, 1-13). Recently landing robots on Mars and the idea of extraction of mineral resources of the Moon and comets has led to some decisions and policy announcements by different governments such as the USA and Luxembourg as well as the publication of several books and papers on this topic (Milligan, 183-184; Price et al, 73–81; Mironescu & Pritchard, 2-3; U.S. 114th Congress, 2015-2016 and Robinson, 668-668).

Space Ethics as a new field of Inquiry and Scientific Research

The new interest in space colonization brings with it many moral issues to the extent that a new field of ethics, typically presented as "space ethics" seems to be under construction if not already practiced (Milligan, 183-184). As Milligan argues in her journal article titled, *Space Ethics in Context*;

> Work on space law and the politics of space has dramatically outstripped the progress of space ethics. Yet, over the course of the past decade and a half, the beginnings of a more solid and credible ethical discourse about space has begun to emerge. The highlights so far are the joint ESA and UNESCO report on "Space Ethics" (2000) and Jacques Arnould's *Icarus' Second Change: the Basis and Perspectives of Space Ethics*, (2013) [1]. Both texts focus heavily on activity in nearby regions of space although they also bring into question the catalyst and ultimate philosophy for various sorts of human activity in off-world. They also do so in a very provisional way, without trying to force the

> pace of the discussion. Instead, they have helped to begin the difficult task of identifying key areas of policy and practice where an ethical review is appropriate, areas such as discussions of risk, the classification of space debris as a form of pollution, and the rethinking of the responsibilities of launch-states (183).

Academics such as Mark Williamson observe that one of the initial steps geared towards the way forward may be through what he terms the "demystification of space ethics" (Williamson, (47-52)). This he puts forward as a central requirement for broadening the topic for discussion (Williamson, 47-52). From his understanding, space ethics should entail in simple terms ''what we should and shouldn't do in space'' (Williamson, 47-52). To clarify his argument, Williamson states that ethical applications are important to almost everything we do, in many ways (47-52). The example he uses illustrates that space developments should be given the same scrutiny with similar ethical codes such as those used in medicine and biotechnology, which affects people directly on every level, and such as those in diverse disciplines of engineering as well as in workplaces mainly related to 'health and safety' issues (Williamson, 47-52).

Space ethics as a discipline is seen to be provoking fundamental philosophical and methodological issues that must be adequately addressed (Chia, 1-1). For example, based on human experience on Earth, would it be prudent to try applying in space traditional ethical theories such as classical utilitarianism and Kantian ethics which have conditioned our moral reasoning and helped in the implementation of our anthropocentric ethical decisions on earth? As an illustration, anthropocentric ethics would readily accept the notion of space colonization as long as the benefits are geared towards enhancing the well-being of humans even when this would come at the expense of extra-terrestrial biota (microbial life if any) and abiotic

environment (Chia, 1-1). However, it is important to recognize that some of our Earth-ethics have been shifting towards looking at the non-human environment as being just as important as humans—deep ecology for example. Hence, Earth-ethics may not necessarily cover extra-terrestrial biota or abiotic environment. Nonetheless, we are compelled to puzzle with ethical issues prompted by the colonization, privatization and commercialization of space. These developments urge us to ponder whether planetary protection only matters to Earth alone or to off-Earth biospheres as well and whether extraterrestrial microbial life and abiotic environments have intrinsic value (Peters, 1). Williamson depicts for us alarming images of debris from spacecraft and upper stage explosions in low Earth orbit (LEO) and debris from launch vehicle separation devices in the LEO which prompts questions of whether the space junk should be classified as pollution (Chia, 1).

Political Philosophy Dimension

In addition to the ethical issues involved in space exploration, there is a political dimension as well; since space is starting to be construed along sovereignty limits, it is an open question whether human history, even in extraterrestrial space, will replay itself (Serumaga, 1-3). For example, the 1967 Outer Space Treaty disallows any commercial exploitation of space (Outer Space Treaty, Article 1); however, in November 2015, U.S. President, Barack Obama, signed legislation pioneering a framework for space companies to mine asteroids and other celestial bodies (H.R.2262 — 114th Congress (2015-2016). This happened even though it has already been agreed among the international community that space should not be made into another scramble for resources (Griffin, 4-5). The new law, which is enforceable as the U.S. Commercial Space Launch Competitiveness Act, risks privatizing a sphere that the 1967 Outer

Space Treaty classified as belonging to the commons. This Treaty, to which the U.S. is a signatory, is unequivocal in its declaration that the surfaces and contents of asteroids as well as other celestial bodies are protected from commercial extractions (Blount and Robison, 160-160).

As Obama's actions demonstrate, imperialistic governments are now starting to change their stance as they now view space as having instrumental value that must be competed for with the intent to extend hegemony and capitalism to space (Jacqui, 1-1). On the other hand, less wealthy countries and their marginalized communities experience the universe from an oppressed position, which is why they feel that space privatization and commercialization will add more to their inability to participate and they will miss out on reaping the benefits of the rich space resources (Jacqui, 1-1).

Essay Overview

The purpose of this research paper is to examine the unfolding ethical issues in the above scenario by looking at the burdens of risk on society and issues of justice as fairness to countries with relatively low-income who cannot fully participate or participate at all in the space rush because they lack the expertise and resources. The presence of uneven burdens of risk to society can result in certain undesirable social and economic effects (Robbins, Hintz and Moore, 89-93). There can also be some issues of uneven burden of risks whereby people are asymmetrically unsheltered from risk and hazard (Robbins, Hintz and Moore, 89-93). Risk is sometimes forced on others, especially poor and minority communities because their range of choices is usually limited by unfair political-economic conditions (Robbins, Hintz and Moore, 89-93). Also, in some instances; information about risk and hazard may be tampered with so that it is misleading;

therefore, the affected people may not necessarily have full and correct information to make informed decisions (Robbins, Hintz and Moore, 89-93).

The research paper will make analysis of issues pertaining to justice as fairness articulated through the theory of justice for a liberal society. The analysis reflects on how this theory should play a role in space colonization. In dealing with ethics of space colonization and privatization, the theory provides a framework for the examination of fair use of political power and helps to set a standard for the order of relevant social institutions that is morally acceptable and congruent to the issues in question in this paper.

Given the ethical issues of space exploration and the political dimension of construing space along sovereignty limits, it is timely to conduct studies of this nature to consider why ethical standards may be essential in furthering the process of developing moral and value models for space colonization, privatization and commercialization. It is paramount to take heed of the compelling significance of this study because it insists on the general principle that the perceived amoral nature of technological developments in space does not stop us from making reflections on right or wrong.

Academic literature written on this topic by multiple scholars is mostly reflected upon from different disciplines outside ethics. The prevalent literature by the likes of Livingston, 170-177, Wayne et al, 389-392 and Gelonesi, 1-4) focus on political philosophy and social philosophy analyses of the unfolding events in juxtaposition to the 1967 Outer Space Treaty efforts. Also, within my readings are journal articles by academic writers who reflect upon how space could be incorporated into international political–economic relations. These include: Spitz, and Stoeger, 17-55; Beery, 92–101 and Baum, 109-123.

My hypothesis is that the prospects of colonizing, privatizing and commodifying space raise the need for clarity on ownership, accessibility, accountability and inability to participate arising for low-income countries, especially since the 1967 Outer Space Treaty which declares space as belonging to the commons is only persuasive and not binding. Thus, just as it happened on Earth, space developments could be driven by morally lacking and behaviorally detrimental models of conquest if premised on the dogma that orchestrated European genocide to indigenous lives across the world for the past millenia; however, ethical frameworks such as global utilitarian, Kantian ethics and non-anthropocentric value ethics may be necessary to help ward off imperialism if they can be adopted for space developments.

This applied research paper employs a qualitative research method to probe causes and effects of emerging trends pertaining to the colonization and privatization of space. Since my thesis statement emphasizes issues such as planetary ownership, access and accountability, I am elicited to probe and delve into materials concerned with speculative scenarios and aspirations of space explorers who are embarking on projects that are currently underway for human settlement on Mars such as Mars One project, current ongoing simulated or mock Mars missions taking place in different countries and the SpaceX recent use of a powerful heavy rocket that carried a Tesla electric car past the orbit of Mars (Roulette, 1-2).

My methodology focuses on investigating how these private space industrial developments affect the commons agreement on the use of space resources since space is stipulated as belonging to the commons by the 1967 Outer Space Treaty. This methodology allows me to delve into frameworks dealing with social marginalization and imperialistic structures. For example, while billionaires are dumping their expensive toy cars into space

(adding to the decried space debris accumulation) the marginalized poor are struggling to put food on the table or a roof over their heads especially in low income countries from where minerals used to build these space rockets and fuel to power them are extracted.

Analyses

Endeavors in space ethics geared towards dealing with the ensuing colonization, privatization and commodification of space are happening in a transitional manner and proactive discussions are paving the way to commence on the difficult undertaking of determining pivotal fields of policy and practice (Schwartz, James and Milligan, 9-261). It can be observed that space ethics embodies multidisciplinary facets because it brings to play various disciplines such as astrobiology, geology to philosophy, law, political science; and from engineering to planetary science. With the current phenomena of privatization of space explorations, we are challenged to resort to the field of space ethics because ethics concerns all aspects of life such as behaving properly as individuals, establishing accountable businesses, innovative organizations and governments, and fostering our society in general to be more ethical. It is then prudent to envisage a scenario of ethical adoption by decision makers in the sub-sequential colonization, privatization and commodification of space resources (Schwartz, James and Milligan, 9-261). This new phenomenon calls for a field of inquiry to probe on a broad spectrum of issues and questions related to the understanding and ethical evaluation theories (Schwartz, James and Milligan, 9-261). For example, do planets contain anything of inherent value, i.e. anything which can be deemed as being valuable for its own sake? Or is space simply an instrument available for our usage – a means to an end? What is the moral status of human beings' relationships to multiple elements of the space? Are humans supposed to have an ethical obligation to respect

or censor their interaction with entities such as asteroids, comets, moons, or planets? In case extraterrestrial life exists, including microbial life, would it be accorded moral consideration? A space ethics analysis of policy making for colonization, privatization and commodification of space is therefore paramount because it is space ethics that will present a set of standards for behavior which will help space institutions decide how they ought to act in a variety of situations. This brings me to puzzle over which of the conventional main ethical theories can best be adopted in the governance and regulation of space industries; taking into consideration the intersection between ethical economic developments, innovation and planetary protection. Becoming more apparent is the awareness of significant mistakes under-pinning our polices for economic developments here on Earth; therefore, a recognition of the need for a change in thinking when carrying out space developments without perpetuating the same mistakes is long overdue.

A Kantian Analysis of Space Exploration

It can be argued through Kantian ethics that our record here on Earth paints a picture of neoliberal and capitalist policies with tendencies to favour the highest bidder at the exclusion of the under privileged and puts profit first at the expense of the environment. For Kantians, there are two questions that we must ask ourselves whenever we decide to act: (i) Can I rationally will that *everyone* act as I propose to act? If the answer is no, then we must not perform the action. (ii) Does my action respect the goals of human beings? Again, if the answer is no, then we must not perform the action. Kantian ethicists would argue that extending to space neoliberal and capitalist policies is immoral because these systems create economic disparities and life threatening environmental injustices; therefore, they are set up in a way that we could

not rationally will everyone to act the way they act either here on Earth or in space. Also, Kantian ethicists would ask whether the action of extending neoliberal and capitalist policies to space would respect the goals of extra-terrestrial intelligent life if any rather than merely using them for humans' own purposes? If the answer is no, then the participating agent must not perform the action. Kant wrote on the possible existence of extra-terrestrial intelligent species in the final pages of the last book that he published, *Anthropology from a Pragmatic Point of View* [Anthropologie in pragmatischer Hinsicht] (1978). In this publication, Kant hinted that the highest concept of the Alien species may be that of a terrestrial rational being [eines irdischen vernünftigen]; however, he argued that it will be difficult to describe its characteristics because there is no knowledge available of a non-terrestrial rational being [nicht irdischen Wesen] which could be used as a reference in regards to its properties and ultimately classify that terrestrial being as rational. This dilemma will continue until extraterrestrial intelligent life is discovered because comparing two species of rational beings has to be on the basis of experience, but that experience has not been possible yet (Kant, 237-238).

In applying Kant's deontological moral theory, it must first be recognized that Kant visualized a kind of respect in which we all can recognize every rational being exists as an end in itself (1) as being not fully comprehensible by any human understanding, (2) as being an end in him- or herself, and (3) as being a potential source of moral law (Kant, 2012). In this regard, since Kant insinuated that the highest concept of the extraterrestrial intelligent species may be that of a terrestrial rational being [eines irdischen vernünftigen]; that implies any encounter with extra-terrestrial intelligent life will compel us under the deontological moral theory to recognize that life as being not fully comprehensible by any human understanding, as being an

end in itself, and as being a potential source of moral law (Kant, 2012). It must be realized that Kant's deontology theory does not go without criticism by critical theorists who believe in dismantling all systems of oppression.

There is also the cultural observation that has been entertained by Kant's critics on the notion that cultures differ considerably about what is right and wrong, good and evil (Fischer, & Hough, 150-187). For example: cannibalism, polygamy practices from which moral sense is to be dependent on education, self-interest, desires and needs (Fischer, & Hough, 150-187). In other words, Kant's recognition of extra-terrestrial intelligent life as being an end in itself may not be applicable in other cultures. For example, some cultures may see such life as having instrumental value or as a means to an end (fit for consumption or a work force). If the deontological theory fails to recognize the different cultural perspectives, then it may be deemed to be too inflexible or absolutist (Fischer, & Hough, 150-187).

A Utilitarian Analysis of Space Exploration

The colonization, privatization and commercialization of space is also recognized by Utilitarian proponents such as Seth Baum, who takes the view that space is of interest to consequentialist ethics because privatizing and commercializing the infinite expanses of outer space may have several good and bad consequences (109-123). His point is that achieving good consequences in space is paramount for human civilization and can mean the building of space colonies (Baum, 109-123). Although he emphasises this view, he acknowledges that when it comes to contemporary decision making, there shouldn't be too many investments directed towards space colonization; such efforts should be geared towards preventing civilization-ending catastrophes (Baum, 109-123).

Baum argues that it is more important to deal first with catastrophes that could end our civilization so that the future generations can colonize space (Baum, 109-123). However, he also cautions that bad consequences may happen if humanity encounters an intelligent extraterrestrial civilization which he says brings concerns about how human beings might conduct themselves if they meet such civilization given our Earthly record of dealing with indigenous lives (Baum, 109-123). On the other hand, he notes that this possibility may reform how we treat less advanced other species on Earth (Baum, 109-123).

The Discovery Doctrine

Amid growing discussions of the need for humankind to attempt space travel, and perhaps even to colonize and inhabit other planetary environments, some scholars such as John Hart are worried that we will be incited by morally deficient and behaviorally detrimental models of conquest such as those engraved in what academics have called the "Discovery Doctrine." His contention made in his thought experiment is that we should be governed by more recent ethically persuasive and ecologically friendly frameworks, rather than by a dogma which manifested European genocide to indigenous lives across the world for many years and continues to do so today (Yong, 62-62). Hart envisions a disastrous encounter with extra-terrestrial intelligent life (ETI) if humans' approach is still premised on "discovery" mentality and attitudes (Yong, 62-62). Not only does he envision this tragic encounter for alien creatures but he is concerned for the human beings that in case these "others" are more technologically advanced in their destructive capacities than we are (Yong, 62-62).

The precedence is that on Earth when nations moved into new territories, there was no understanding yet on how human beings could impact other worlds' environments, their native

inhabitants and human responsibilities toward them, but now we know and therefore should act accordingly based on experience (Hart, 1-415). As John Hart points out in his journal article titled, *Cosmic Commons: Spirit, Science, and Space;*

> In Western religious thought and European cultural settings, people settled into what they believed to be their divinely designated place and role. They were the most intelligent life on Earth, they had been created specifically by God in God's image. However, over the centuries, scientific discoveries stimulated a significant reassessment of human's previous understanding of their place on Earth and in the universe (2).

Hart's argument is that people should further their knowledge and understanding of a new reality that human beings are frankly not just the only ones who possess an evolved thinking in the cosmos, and that they are not the only phenomenal "image of God" in creation. This furthered knowledge and understanding according to Hart could possibly be catalyzed to an enlightened realization and sense that they must not only be indifferent about past inaccurate perceptions based on their previous misinformation, but probe reflectively new intellectual and spiritual realms as they traverse the material universe (Hart, 1-415). Hart argues that human journeys into space became necessary primarily not to extend research or to have general appreciation of cosmic mysteries, but to escape the negative consequences of research and technology on earth (Hart, 1-415).

Accumulation by Dispossession Perspective

David Harvey's political economy notion of accumulation by dispossession could be a resourceful framework which one can use for gauging how unethical space colonization,

privatization and commercialization could be a harmful endeavour (71-90). Harvey's framework could be used to demonstrate that the privatization and commodification of space for profit accumulation purposes cannot be a harmless process; rather it has the propensity to encompass the forceful and violent reorganisation of extra-terrestrial biota and abiotic environments as they may be subjected to the control of capital (Gordon & Webber, 63-87). The accumulation by dispossession theory disenchants us with aplomb that the current shift from the peaceful use of space to the commercialization of space resources has the capacity to employ capitalism tactics such as the use of force and theft to defraud the world its value—both human beings and nature—in its unquenchable yearn for profit. Although, here on Earth, strategies of accumulation by dispossession usually face stiff resistance from the affected communities; it is an understatement to say the harm they always perpetrate leave behind many casualties and space developments if carried out the same way will not be an exception (Gordon & Webber, 63-87).

The Non-anthropocentric value theory analysis of space colonization

From the non-anthropocentric value theory perspective, commodification of space resources that have never been touched by earthlings before could be seen as being instrumentalizing them; therefore, taking away their intrinsic value (Nicholson et al, 389-392). The non-anthropocentric value theory corresponds by interrogating how space ethics would apply, where moral responsibility might fall in situations where the territories the actors encounter may have never been in contact with Earthlings (Klein, 8-10). Will we treat these territories as having intrinsic value or as having instrumental value? For example; after almost a decade in space, NASA's Cassini spacecraft ended its seven-year journey of scientific observation

in Saturn (Spilker, 2-2). In 2017, the operators allegedly submerged Cassini into the planet to preserve Saturn's moons' pristine nature for future exploration (Spilker, 2-2). In this example, it seems that NASA scientists were having ethical concerns for possible life on Saturn's moons; therefore, they decided to destroy their spacecraft to respect pristine life. However, if Cassini burned and vaporized into smoke particles as it entered Saturn' atmospheric structure, then, issues of planetary contamination can still arise because even though "vaporize" may mean "disappear" in most people's minds, that's is not necessarily the case with spacecraft hardware falling into an atmospheric composition of reactive gases (Choi, 1-3). Such debris could generate "terrestrial smoke particles" of unknown composition and reactivity entering an extra-terrestrial sphere (Ross et al, 2009). Citing a study led by Martin Ross, Leonard David alerts that;

> In that crucial 20 seconds of re-entry, you go from heating to melting to vaporization and then back into dust. How does that happen? What is that composition? We don't know at all. We need to get away from this idea that vaporization equals disappearance. "Vaporization equals dust production. That process isn't well-understood at all. Again, we need to know the microphysics of these re-condensed particles (2).

The study points out that this process is essentially burning computers, during which big chunks of different materials are subjected to extreme heating and some molecules are very reactive, so they may have a significant effect on Saturn's atmospheric chemistry (Ross et al, 2009). The chemical kinetics of the molecules that are originated in this way has not been examined (Ross et al, 2009).

It must also be observed that NASA as a public owned enterprise is compelled to conduct itself in ethically higher standards it is difficult to assumed that the same will happen if other

scientists or some private corporate sponsored scientists who may find themselves in this circumstance would conduct themselves the same way as the Cassini mission scientists. However, this is just a projection of a possibility because government agencies are not always more ethical than private companies. Therefore, without a legally binding code of ethics that disallows the abandoning of spacecraft

or burning them in other planets, it is an open question as to whether private companies or other government agencies would hold themselves to the same higher standards if there is profiting to be made from what is discovered in Saturn's moons.

An anthropocentricism ethic Analysis of Space Exploration

It is important to realise that anthropocentrism is engrained in neoclassical economic conception of distributive justice especially when it comes to profit making or placing humans at the center of all beings and as the only being whose life has intrinsic value (Pelletier, 1887-1894). This anthropocentric model is known for its short-sightedness when it comes to environmental sustainability which has implications for generations to come (Pelletier, 1887-1894). These failures reflect a fundamental flaw within the anthropocentric ethical premises that inform the spectrum of values and the operational realities of economic activity in a finite biosphere (Pelletier, 1887-1894). In this regard, the privatization and commodification of space by corporations who embrace the neoclassical economic model may cause more harm than good not only on how they will handle the new extra-terrestrial territories but because their new-found resources would most likely not be equitably distributed. Likewise, this anthropocentric approach towards space privatization could infringe on the core values of egalitarianism because if policy makers don't care about the environment and other living

beings; then as United Nation Report on Climate Change 2013 points out, chances are that they would not care much about vulnerable people in the society or contemplate on equal consideration of interest for all. For example; a United Nations Report of Climate Change 2013 reveals that failure to prevent climate change in the future will lead to vulnerable pensioners being left on their own during periods of heatwaves in industrialised countries (1-33). The same will apply to single mothers in rural areas, workers who spend most of their days outdoors and slum dwellers in the megacities of the developing world (UN Report, 1-33). These are some of the vulnerable groups who will feel the brunt of climate change as its effects become more pronounced in the coming decades (UN Report, 1-3). It can therefore; be argued then that people from low-income countries in the issue of colonization, privatization and commercialization of space would possibly have limited if not annihilated ability to equally enjoy the space resources or have their interest equally considered if space developments are anthropocentric.

In Defense of the Anthropocentric Space Exploration

Wilfred Beckerman and Joanna Pasek would both ponder why should we consider protecting other planets and extra-terrestrial biota or why like Kant should we accept that the highest concept of the Alien species may be that of a terrestrial rational being (83-88). These academics are of the school of thought that anthropocentricism offers the most satisfying answers to human beings compared to other "centrisms" (Beckerman, and Pasek, (83-88). The argument they would bring forth in defence of anthropocentric space exploration would be against the notion that we should invest in ethically astute space developments that have consideration of interest for all including preserving pristine planets for their own sake. They would raise several questions about this perspective such as; "if we grant space intrinsic value,

how do we trade-off its “interests” against ours (87)?” “Is space completely equal to us or do our interests have higher moral standing (87)?” “If the latter–how much higher (87)?” “What are space’s interests (87)?” “Does space want to be preserved (87)?”

Beckerman and Pasek would argue that these questions are easier to answer within what they call an anthropocentric framework than by a biocentric framework (83-88). Their observation would consider that just as the natural history of the Earth without anthropocentric interference is a chronicle in which the only consistent element is change, the same can be said about some planets such as Mars to pick a closer example (Beckerman and Pasek, 83-88). Their view would entail that even without human centered space colonization, chemical or gas reaction and meteors which have explosive power like missiles can strike planets – sparking massive explosions that could cause changes such as craters; therefore, change will always be there (Beckerman and Pasek, 83-88). For instance, their claim is that even without anthropocentric workings, there were five major extinctions during the history of the earth of which it is plausible to argue that, from an evolutionary outlook, these extinctions influenced human existence; the same can be assumed would be their view about other planets and extra-terrestrial biota and abiotic environments (Beckerman and Pasek, 83-88).

Beckerman and Pasek’s analysis explains that the basic problem of ascribing an intrinsic value to Nature brings the question of what Nature actually is (Beckerman and Pasek, 83-88). Can we say nature is a state or is it an ever-changing process (Beckerman and Pasek, 83-88)? The paradox the two scholars reveal is that anthropocentrism always prevails because even when we want to preserve Nature, we want to save it from ourselves and that notion places us outside the natural world (Beckerman and Pasek, 83-88).Thus, if we are part of Nature, then,

our activities that could harm nature should be viewed as simply part of the evolutionary pressure which humans happen to be good at accelerating faster than other species in the short run because in the long run we might actually be harming ourselves (Beckerman and Pasek, 83-88; Singer, 1-25). Another question that Beckerman and Pasek, ask is "if we are not part of the natural world then where is this world (87)?" As the two authors puts it;

> There hardly exists any ecosystem on this Earth that has not been heavily influenced and indeed, shaped by human activity. Not only in the modern age. Just think of the medieval large-scale logging or, if that is not distant enough for you, the "success" humanity had in annihilating most megafauna on every single continent [sic]. If most of Nature has emerged under human influence (although the severity of this influence varies, of course): what is this Nature that we are supposed to protect for its own sake? Is there any at all (88)?

Following the conceptual and practical problems alluded above, the authors would feel that the best available ethical basis for space exploration is anthropocentrism.

Is Deep Ecology more viable than Singer's Utilitarianism for space exploration?

Deep Ecology is a biocentric environmental philosophy that despises a conceptualization of nature only in its perspective of being an instrument for human beings to deplete (Goldsmith, 1-43). Proponents of this environmental philosophy which is mainly anti-utilitarian would argue strongly that it can serve better the concept of keeping space as a protected planetary area that should be allowed to remain pristine. However classical utilitarians who would want to see more businesses and exploration operations in space will not want decision makers to adopt this philosophy because it is too concerned with the rights of the living and non-living environments

to have value and exist outside of any utility, use, observation, benefit, or even knowledge of man (Goldsmith, 1-43).

According to deep ecology, even space rocks have rights; therefore, there would be very limited or no extractive industrial activities in space if this model is adopted (Goldsmith, 1-43). Because of an emphasis on the 'intrinsic value' argument, there would be ethical challenges of any economic ventures in space (Goldsmith, 1-43). This approach creates a lot of tension between human beings and the environment because it does not accord human beings the slightest privilege of assuming to be more important than the environment they live in or explore (Goldsmith, 1-43). Ethically it can still serve the interests of business operators in space, but those businesses will have to abide by stringent regulations patterning to the rights of the extra-terrestrial biotic and abiotic environments (1-43).

Contractualism as a viable option for Space Colonization through its Trusteeship theory

It can be argued that requirements of trusteeship principle, which ensures that humans have an obligation to sentient non-human animals and the environment should be incorporated within the ethics of space privatization and commodification plans (Ashford and Tim, 1-32). As such, the duty to trusteeship approach may provide a novel justification for sustainable business practices in space exploration (Ashford and Tim, 1-32). However, it is common knowledge that social contract theories are the most anthropocentric that leave out non-human beings and the environment on the basis that all moral obligations are between parties to the social contract (Ashford and Tim, 1-32). Therefore, some people invoke the classic social contract interpretation and cite it as giving them "no obligations" to animals or the environment who cannot be parties to the contract. However, as the consequences of human impacts on the ecological systems of

the earth gets obvious, it creates more acknowledgement of the intrinsic connections between these systems; social justice and economy (Lubchenco, 491-497). Unprecedented environmental and social changes propel scientists to devise a new social contract in which animals and the environment can be regarded as quasi parties in the social contract even though they are not covered thereunder (Lubchenco, 491-497). The classical social contract' view is unfortunate because social contracts could be binding; therefore, they could be enforceable to hold humans accountable for their actions and consider the environment as a "moral patient", somewhat like how a person with intellectual disability can be party in an honorary way to a human social contract. Scanlon's contractualism may be to some extentconsiderate than other forms of contractualisms if we are to advocate for non-anthropocentric contractualism developments in space (Ashford and Tim, 1-32).

Scanlon's contractualism is not a theory of the whole of morality, but only a theory of the morality of what we owe to other persons (Scanlon, 595-607). This creates a gap and leaves it open to the possibility of our obligations to sentient non-human animals and the environment cast out of the bracket of this part of morality. Which means in terms of space exploration, Scanlon would have problems recognizing extra-terrestrial biota and abiotic environments as having intrinsic value or as being ends on themselves. If this is the case of his theory, then Scanlon on this part would be regarded as endorsing speciesism and anthropocentricism because he would be explicitly putting aside any moral obligations we might have regarding the natural environment and animals (Scanlon, 179). However, Scanlon somehow attempts to redeem himself by un-enthusiastically suggesting a possible way that obligations to the animals could be accommodated within contractualism (Scanlon, 179). These obligations he says will be

carried out through the notion of trustees or moral patients, to whom defensibility of proposed principles can be offered, on behalf of the animals they represent (Scanlon, 183). Ironically, this obligation is not extended to the biotic or abiotic environment under the constractualism principle.

Anticipatory Self Defense in space by or against Aliens

Important to the issue of space ethics is understanding that there are possibilities that other living beings could be present in space; therefore, we may not be alone in starting anew (Ball, 347-349). It has been observed that one of the elements of private space venture is that they increase the potential for encountering extra-terrestrial life if any and that brings into question our ethical responsibilities towards such life (Ball, 347-349). If encountering extra-terrestrial life results in war, it is obvious that low income countries could be more adversely affected due to their lack of resources for anticipatory self-defence. Low income countries may also be adversely affected due to the fact that other powers may forcefully displays them from their lands so they can extract mineral resources for military purposes. It is possible that extra-terrestrial intelligent life (ETIL) if any may deem our space colonization and privatization missions as attempts to defy territorial integrity of their sovereign planets. This provokes a question of whether the ETIL would be justified in declaring pre-emptive strikes against us in our attempts to colonize space. From Just War Theory perspective, the concept of nuking Mars to warm it up for terraforming purposes could be viewed as eminent attack that warrants pre-emptive strikes by ETIL if there is any living in Mars. Under *jus ad bellum*, a state is entitled to use military force in self-defence against an "armed attack" against it (Clough and Stiltner, 253-271). However, this theory may not apply because no one knows yet if there is life in Mars or other planets. The

customary conventions of the Just War Theory are not applicable in this case scenario because it is not known yet what kind of civilization is out there and what kind of ethical fashion is necessary to apply (Clough and Stiltner, 253-271). The significance of considering these issues is that the current call for nuking Mars for the purpose of terraforming it may prompt issues of national or international security and public safety concerns (Genovese, 1-10). The risk burdens of these could be asymmetrically detrimental to low income countries as these non-participating countries may not be well informed to in advance or have the resources to best prepare for such eventualities.

The Plurality of Worlds Debate

It is important to recognize that the debate on the plurality of worlds (multiple inhabited planets) can be useful as we seek answers about the ethical implications of space colonization, privatization and commercialization. Attempting to colonize other planets without considering the plurality of worlds can be detrimental to the survival of such worlds or ours. Although the debates on the plurality of worlds are ancient, it can reasonably be observed that these debates have always been passionate although in the past there was no technological advancements to support space missions with humans travel to space or to send robots with cameras to explore space. Understanding the history of these debates is also important because it helps to give more perspective on what has been done or discovered in the past up to the contemporary era. According to Steven J. Dick, ancient atomists embraced the concept of a plurality of *kosmoi,* premised on the impossibility of packing infinitely all atoms into one *kosmos* (Dick, 11-98). However, Aristotle provided an antithesis surmising his concept on a unique natural place for each particle in the universe (Dick, 11-98). The debates shifted when Copernicus influenced the

demolition of Aristotle's *kosmos* switching the debates from plural *kosmoi* to plural earths (Dick, 11-98). This brought to light the likes of Johan Kepler who argued empirically, emphasizing visible similarities between the earth and other celestial bodies (Dick, 11-98). Following Kepler was Fontenelle's notion of many inhabited worlds accessible to a wide public (Dick, 11-98). Fontenelle also articulated theology about extra-terrestrials who were not human – no children of Adam (Dick, 11-98).

In juxtaposition, contemporary debates on the plurality of worlds are boosted and made more believable by deep space exploration projects such as the NASA Mars rover Curiosity currently traversing the red planet to carry on scientific explorations (Wall, 1-2). At the same time, there are "Mock Mars Missions" taking place in several countries to simulate a human mission to Mars such as The six people "journey to Mars" mock mission which took place in Hawaii in 2017 (Shultz, 2-5). The simulated mission was designed to enhance comprehension on the psychological effects of manned missions (Shultz, 2-5). The lead organization in this mission was NASA, which has set a goal to send human expeditions to Mars by the 2030s. It is anticipating that the mock mission findings would be handy by assisting in the selection of crew members for the planned mission to Mars (Shultz, 2-5). Private companies as well do have ambitions to reach Mars at some point. SpaceX and Aerospace firm Lockheed Martin have carried on different simulated expeditions and stations in training for the red planet between 2022 and 2028 (Shultz, 2-5). These missions attest to the fact that contemporary debates on the plurality of worlds are boosted and made more experimental by deep space exploration projects.

Space colony ownership vs Commons' rights

The debate on the plurality of worlds and humans' intentions to colonize other planets propels us to subject to moral scrutiny the new technological possibilities in space colonization and privatization. They also force us to confront specific questions of the commons' rights, risk burden, and justice-as-fairness. For example, if a Country's space mission or a private company which embarked on a space mission decides to terraform a planet to make it habitable to humans and settles on it, would that planet become that country's territory, colony or a private property of the company or does it still belong to the commons since the 1967 Outer Space Treaty deem space as belonging to the commons? An attempt to answer this question could be made through the notion of Proudhon's theory of ownership, justice and equality. Proudhon brings attention to the aspects of property ownership; noting that property ownership by its very attributes rival with the objectives of justice and equality (Christman, 15-161). He makes a controversial claim that "property is theft" however, he does not mean simply that private property is not congruent with justice and must be abandoned (Christman, 15-161). To him, there is an element within the structure of property ownership which in his perspective is the real villain in all the controversial struggles for just social relations. His argument entails the following;

> Equality of condition [is] an essential implication of justice; property ownership, in any form that included the "right of increase" destroyed equality, so property [is] unjust or (impossible) (4).

The "right of increase" for Proudhon, was the right to gain income from ownership of property through either the productive development of the resource or its exchange.

If we are to take this explanation and apply it to the question asked which is; "if a Country's space mission or a private company which embarked on a space mission decides to terraform a planet to make it habitable to humans and settles on it, does it become that country's territory, colony or a private property of the company or does it still belong to the commons?" In Proudhon's view this would be "theft" if the ownership includes the "right of increase" because according to Proudhon, the "right of increase" destroys equality and makes the property ownership unjust. The "right of increase" would in this case occur when the country or private company that terraformed the planet would want to gain income from the ownership of that planet either through the productive development of its resources or its exchange. The question that arises from this scenario could be what if the country or the private company wants the ownership to include the "right of increase" but the proceedings would be distributed among the commons since space resources are supposed to belong to the commons, would that "right of increase" still be frowned upon? The answer here is no because it must be recognized that Proudhon did not reject all forms of ownership; he actually argued against the view of other socialists of his day who contended that all ownership must be abandoned (Christman, 15-161). The justification of this shift encompasses a change in his portrayal of property; however, it did not constitute an abandonment of his principles of justice (Christman, 15-161). His claim was that ownership is the essential element of the kind of property that is constitutive of justice (Christman, 15-161). For Proudhon, the way in which a person owns property is key to questions of justice just as is the amount of such properties that s/he owns (Christman, 15-161). Proudhon argues that goods should be assigned to owners in a generally accepted distributive scheme and the distributive justice must concern itself not just with "who has what" but with the nature of

"having." In this case Proundhon would not have issues with a country or private company owning a planet but he would take issues with the nature of "having" the ownership (Christman, 15-161).

For Proudhon, the aspects of possessing property as one's own – the rights, liberties, and authority that people have in relation to their properties translate to what he termed the "structure" of their ownership (Christman, 15-161). Therefore, if a country or private company would colonize say Mars, what would matter to Proudhon would be the aspects of possessing the planet as their own – the rights, liberties and power that the country or company would have in relation to that planet. This translates to the "structure" of their Planetary ownership (Christman, 15-161). However, Proudhon does not have an answer in this theory on what the proper structure of ownership should entail; in other ways, he would probably have no answer to what the proper structure of ownership should entail when it comes to a country or private company terraforming and colonizing a Planet. Despite these facts, he would want to put this context into the forefront of discussions of distributive justice to understand the "structure" of the Planet ownership or colonization by countries or private companies (Christman, 15-161). Proudhon would not be complacent in the prevailing status quo such as by taking part in debates over distributive justice questions taking place without an explicit discussion of the nature of ownership. He would not simply have presupposed that there are two relevant alternatives: private individual ownership, where owners have "dominion" or "sovereignty" over the goods (capitalism), and state or social ownership of all resources (socialism); instead he would most likely want to explore other avenues other than these two.

Karl Marx's concept of property ownership

Another way of providing an answer to the question of planet colonization and ownership by a country or private company can be achieved by using Karl Marx's concept of property ownership. The concept of property ownership in Marx's writings is central to his social and political philosophy as well as his arguments for and against various forms of property ownership (Chitty, 685-697). These provide a key to understanding several crucial notions in Marxism, for example, what he meant by defining "communism" as a radical restructuring of society, including the abolition of private property (Chitty, 685-697). In this case, Marx would recommend that a country or private company that terraforms and ultimately colonizes or claims ownership of a planet in space should comply with “communism.” He would advocate for the abolition of the company or country’s private ownership of that planet especially since the Galactic sphere is believed to belong to the commons by the 1967 Outer Space treaty (Chitty, 685-697). It has to be understood that this international agreement was incepted under the understanding that no living being except humans has so far announced themselves to claim ownership of extra-terrestrial planets. Unless, an extra-terrestrial intelligent or sentient life shows up and claim sovereignty over space; then humans may be justified in expressing their interest to use space for peaceful purposes deemed resourceful for survival.

According to Marx’s theory, in market society individuals recognise each other simply as property owners, but in communist society they will recognise each other as fellow human beings with needs (Chitty, 685-697). Therefore, his notion of communism fits well in the idea of space belonging to the commons which in his view entails fellow human beings with needs. Marx’ approach would favour people living in low income countries as it will not allow them to

be left out in sharing the ownership of the terraformed or colonized planet (Chitty, 685-697). However, this definition of the commons could face a challenge from non-anthropocentric thinkers because they would want the commons to include non-human animals as well as other sentient beings. In this regard, Marx would be regarded as practicing speciesism by global utilitarian proponents such as Peter Singer who would view Marx as only caring about the well-being of humans but ignoring other systems of oppression.

Does space really belong to the commons?

When we speak of space as belonging to the commons, one other question that arises is whether extraterritorial intelligent life if any would agree to this notion of the commons as defined by humans. Would they submit to human beings' claim that their panets belong to everyone and that we can just go in and start extracting minerals or conducting scientific experiments on their Planets' biota without their permission? Can we allow them to mutually do the same here on Earth, to carry out invasive experiments on humans and other living beings or non-living beings? However, as it has already been countered, this argument is immaterial until the extra-terrestrial intelligent life shows up and makes that claim.

Justice as Fairness to low income countries

These questions take us back to the point of how people in the less industrialized world get impacted by these new space developments. Will the marginalized people from these low-income countries need immigration visas to travel to space if their governments have not been able to secure their own space colonies (Serumaga, 1-1)? Are there any commons' accountability mechanisms in place or risk burden remedies for damage if space debris starts causing tragedies

to non-participating countries such as; say, a piece managed to avoid burning up during descent to re-enter Earth and managed to hit and take out a building? This could be a tragedy—especially if life were destroyed during the incident. For example, emerging reports are that China's first prototype space station, Tiangong-1, came falling down back to Earth on April 1st, 2018, (Wall, 1-3). Tiangong-1, launched without anyone aboard on Sept. 29, 2011 and settled into lower earth orbit about 217 miles (350 kilometers), not far from the International Space Station.

The space station was built to keep working for just two years; therefore, the year 2013 marked the end of the space lab's operational life because China put it into "sleep mode" shortly thereafter (Wall, 1-3). Chinese officials had wanted to de-orbit Tiangong-1 in a controlled mode to guide it into Earth's atmosphere; however, in March 2016, Tiangong-1 was reported to have stopped sending data back to its mission operators (Wall, 1-3). It was later this year 2018 reported that Tiangong-1 would re-enter earth in a crashing mode and most of its components will break apart and burn up in Earth's atmosphere, but some of the space lab's stronger pieces will probably survive re-entry which can pose a danger to human life (Wall, 1-3). These flaming space-junk chunks' exact location of re-entry remained unknown until it fell on April 1st (Wall, 1-3). Its uncontrolled fall to Earth mimics that of the U.S. Skylab space station in 1973 whose pieces rained down on rural Australia (Wall, 1-3).

Although there is no life known to be lost due to falling space debris, the impact of the falling space debris on the earth's stratosphere needs to be studied as already stated (Ross et al, 50-82). This call by Martin Ross' study alerts that space junk hardware falling back to Earth can affect the atmospheric ozone layer and cause it to deplete; therefore, re-entering orbital debris should be academically researched (Ross et al, 50-82). Such debris, he said, generates "re-

entry smoke particles" (RSPs) of unknown composition and reactivity (Ross et al, 50-82). The study's model suggests that at least 50 percent of a given debris object will end up as RSPs (Ross et al, 50-82). Although falling defunct satellites seem to be rampant these days, they are reported as not the biggest hazard infrastructure and human lives here on earth; instead, it is the small stuff that matters such as the accumulation of debris in space which is putting satellites and astronauts at risk (Magallanes, 1-30). Also, little is said about liability should satellite debris injure people or property on its way down. The 1972 U.N. Convention on International Liability for Damage Caused by Space Objects (Convention) touches on this topic; however, its process of recovering damages is too vague to be enforceable (Magallanes, 1-30).

Asymmetric Risk Burdens

This illustrates how the burden of risk from falling space junk can impact us here on Earth as we cannot remain unworried while knowing that uncontrolled pieces of a space station could be crashing down anytime into our stratospheric ozone layer emitting reactive gases. There are issues of uneven burden of risks whereby people in low income countries are asymmetrically unsheltered from risk and hazard since they may not have proper information disseminated to them to know what may just happen to them (Robbins, Hintz and Moore, 89-93). The risk is being forced on them because they are the least beneficiaries of space technology. Poor and minority communities in low income countries will likely have their range of choices of not being exposed to the risk limited by unfair political-economic conditions. For example, having to still drink from a water pond even if they know the space debris fell in the water pond because that is their only source of drinking water also because they may not know that it is poisonous (Robbins, Hintz and Moore, 89-93). Also, knowing how imperialistic governments treat people

in low income countries, chances are that the information about risk and hazard from the falling space debris, will likely be tempered with so that it is misleading if the responsible country knows know it will affect people in low income countries; therefore, the affected people in low income countries may not necessarily have full and correct information to make informed decisions (Robbins, Hintz and Moore, 89-93). The law of finder's keeper does not apply to space junk, so if this debris falls in your backyard you cannot claim it, it belongs to China (Robbins, Hintz and Moore, 89-93).

If space belongs to the commons then maybe researchers should make policy recommendations to United Nations to formulate an international treaty forbidding the launch of any more non-reusable space stations, and as for any permanent ones past their usefulness, they should be disassembled on orbit and parts recycled for other constructive purposes. These are examples of the perfectly reasonable and practical items that could be achieved by the commons if space does really belong to them.

Humans' Dependence on Space Technology

Our dependence on space technology is often trivialized but any major disruptions of our access to this technology can be detrimental to our lives. This reinforces the need for a formulation of enforceable regulations targeted specifically towards the use of lower earth orbit. It is futile to suggest that the 1967 Outer Space Treaty can on its own govern the peaceful use of the entire space. Space is enormous if not infinite; therefore, it is more reasonable to recommend that there must be a special treaty that specifically for instance; deal with the use of the lower earth orbit and the one that specifically regulates say the terraforming and

colonization of Mars. The challenges facing the use of the lower earth orbit are not the same as those that will affect the deep space exploration such as asteroid mining for example or space tourism or the one-way Mars missions. The Canadian Broadcasting Agency science writer, Mortillaro, recently published how space debris threatens to disrupt our daily lives through their potential to impede our ability to access space technology. Mortillaro noted that;

> While space junk may seem inconsequential, the threat it poses to our daily lives is real. We largely take the importance of satellites for granted, but we have come to depend on them for anything from communications to weather [monitoring] to GPS. If you use a cellphone, you're dependent on satellites (2).

Referencing to projections made by European Space Agency, Mortillaro alerts us about the exponential growth of space junk by pointing out that there are roughly 166 million human-made articles in space, differing in size from one millimetre to the size of a refrigerator (Mortillaro, 1-2). Although not every piece is large, it is important for the public to know that every piece threatens to disrupt our daily lives and a danger to the life of an astronaut (Mortillaro, 1-2). It is common that the importance of a strong space industry and how it benefits the society is often trivialized. However, it can easily be drawn from the frequent daily use of; digital x-rays, mammograms, CAT scans or heart monitors and specialized heart surgery to clear blockages in patients' veins, to highlight our benefits from technology first built for use in space (Mortillaro, 1-2).

Farming techniques, food production and the creation of new medicines are also major potential beneficiaries of the space exploration technologies. The space technology directly benefits all of us in the industrial world, as food producers or simply food and medicine

consumers (Mortillaro, 1-2). However, as Captain Bruce L. McDermott puts it in his journal article, “Outer Space: The Latest Polluted Frontier,” “of all the artificial satellites now circling the Earth, less than five percent represent operational, functioning satellites, the rest are deemed to be space debris or junk (143).”

Astrobiological Contamination Risks and Planetary Protection

The history of neoliberal and capitalist policies here on earth depicts unwavering evidence that privatization and commodification of space will have the propensity to elicit poor ethical practices. As Dave Hill and Kumar Ravi puts it;

> For neoliberals, “profit is God;” not the public good. Capitalism is not kind. Plutocrats are not, essentially, philanthropic. In capitalism it is the insatiable demand for profit that is the motor for policy, not public or social or common will or good. With great power comes great irresponsibility. Thus, privatized utilities are run to maximize the shareholders’ profits, rather than to provide a public service and sustainable development. These are not on the agenda of globalizing neoliberal capital (2).

As a practice, the neoliberal approach towards space developments will as usual want to roll back the state, to let private enterprises make huge profits relatively unhindered by legislation and this may come at a cost of increased planetary cross contamination risks. These risks may more adversely affect the non-space participating low-income countries that may mostly not have resources for preparedness against the return of extraterrestrial materials or life forms that could harm Earth’s inhabitants or biosphere, i.e., backward contaminations that could cause out of control pandemics (Wayne et al, 389-392). There must be a contingency approach that if

there is no life in space, private companies will be rigorously regulated through stringent space ethics on what are their responsibilities to elaborate, non-living systems (Gelonesi, 1-4)?

Societal and non-scientific factors represent potentially significant concerns for the future privatization and commodification of space especially in areas involving planetary protection. Revised planetary protection guidelines that take into consideration the new phenomena of private companies now leading the way in space ventures should be formulated for the subsequent management of planetary protection to ensure that key audiences such as members of the public obtain needed information in a timely manner.

The revised guidelines should be legally binding to curb aspects of astrobiological contamination risks where bringing extra-terrestrial materials from space may cause diseases on Earth indiscriminately. This is known as ‘‘backward contamination’’ because it entails the contamination of Earth systems by potential alien life (Conley, 792-797). Additionally, issues of concern to planetary protection include ‘‘forward contamination’’, which entails the contamination of other solar system bodies by Earth microbes and organic materials (Conley, 792-797). As Conley puts it;

> Forward contamination involves contamination that might invalidate current or future scientific exploration of a particular solar system body, and that might disrupt the planetary environment or a potential endogenous (alien) ecosystem. Backward contamination involves the potential for harmful contamination of the Earth, and for human missions includes the possible immediate and long-term effects on the health of the astronaut explorers from possible biologically-active materials encountered during exploration (792).

However, it is important to note that is it difficult to know what our ethical responsibilities toward truly alien forms of life are because in the absence of concrete examples of extraterrestrial life to reference and reflect upon, how can ethicists even begin to consider how humans ought to act in relation to organisms that we know nothing about (Impey, Chris, Spitz, and Stoeger, 17-55)? Rather than setting out to resolve this quandary, some philosophers argue that it is much more feasible to engage in thought experiments and to identify and investigate some of the problems that might arise and attempt to see if applying classical theories in Western moral philosophy to extraterrestrial life would work (Impey, Chris, Spitz, and Stoeger, 17-55).

Maximization of Self Interest vs Distributive Justice

Since the U.S. signed a new law that reversed decades of space law, the question now is whether other countries may feel the pressure to do the same or will they continue to abide by the 1967 Outer Space Treaty which treats space as belonging to the commons. It remains an open question what prompted the move by the U.S. from consideration of space as belonging to the commons and why they prefer to under fund the International Space Station and to have NASA subcontract most of its work to private companies (Hutcheson, 295-297). Was this an issue of efficiency? An attempt to answer these questions can be assessed through an interpretation of maximization of self-interest and distributive justice. Self-interest is defined as is actions that propel people to maximize benefit. Adam Smith, who is held at high esteem as a modern economist, depicts that the utmost economic benefit for all is often attained when individuals act in their own self-interest. Smith's account of the "invisible hand" theory brings to light the notion that when many people act in their own self-interest, goods and services are produced

that benefit consumers and producers (Smith, 453-71). Smith argued with economists of his time against restrictions on imports and against the merchants who supported protectionism, forming nationalist pressure groups who took it upon themselves to intimidate the legislature (Smith, 453-71). He did not necessarily disagree with the fact that protectionism or domestic monopolies are beneficial for preserving specific industries; however, he did not see free trade as an absolute threat to domestic industries (Smith, 453-71). In fact, he saw it as a necessary healthy competition which would render to establish stronger mechanisms to support domestic industry (Smith, 453-71). He argued that such success is driven by an "invisible hand" to maximization of self-interest as opposed to distributive justice frame work of equality (Smith, 453-71). In this regard it can; therefore, be argued that the U.S. moved away from the idea of space as belonging to the commons and adopted the maximization of self-interest by private companies which in their view would spark space industrial growth whereby more goods and services will be produced that benefit consumers and producers (Smith, 453-71).

An antithesis to this approach is that it benefits the privileged; therefore, the winners would come at the expense of the marginalized groups including those in the systematically colonized low-income countries (Hill and Ravi, 2-11). In this case, major opponents of the self-interest approach would mostly emanate from proponents of distributive justice within the framework of the capability approach which advocates for the removal of inequality of opportunity to create a level playing field that enables every individual including those in low-income countries to pursue space exploration (Rippin, 9-135). In distributive justice, inequality of choice or effort is openly discouraged (Rippin, 9-135). However, this approach works better under a welfare economic system but creates issues of efficiency in other economic systems

(Rippin, 9-135). In this case, proponents of space privatization and colonization would argue that equality is not the only social charge with which we must be concerned because there are demands of efficiency as well (Rippin, 9-135). Adam Smith in this matter would argue that the notion of emphasizing equality of capabilities in the space industry should be coupled with aggregative considerations to avoid chronic dependency syndrome which can curtail the capabilities that private space industries and national space agencies could altogether have (Rippin, 9-135). He would note that the concept of focusing more on equality in space exploration cannot be well understood if simultaneous attention is not paid to aggregative consideration to the efficiency aspect (Rippin, 9-135). This therefore, brings us to the suggestion that currently the space exploration industry is more concerned about efficiency and is less concerned about fairness considerations which they worry can result in poor resource management (Rippin, 9-135).

A much more robust examination of the U.S.'s new approach to space exploration is provided by Blount, P. J., and Christian J. Robison in their journal article *One Small Step: The Impact of the US Commercial Space Launch Competitiveness Act of 2015 on the Exploitation of Resources in Outer Space.* Blount and Robbinson advance an analysis of the U.S. Commercial Space Launch Competitiveness Act ("CSLCA") which was passed by the United States Congress in 2015. Title IV of the Act, *Space Resource Exploration and Utilization*, now allows the commercial property rights in resources extracted from space bodies. Both Blount and Robbinson make arguments that although the CSLCA received a huge welcome from the commercial space sector; some critical theorists in the academia denounced the new development saying that the legislation was a violation of international space law. Some

commentator likened the law to a “land grab” and suggested that the bill was an attack on the Outer Space Treaty regime altogether. However, Blount suggests that those in favour of the CSLCA contended that the Outer Space Treaty was written in high consideration of innovation (160-160). The law makers had in mind a law that was uncertain about future technological developments; therefore, proponents of the CSLCA argue that the Outer space treaty was more about immediate threats to international peace and security (Blount & Robbinson, 160-160). In this regard, they established principles with open definitions but left States a leeway to negotiate for the law to adapt when new technologies emerge. Blount, explains that proponents of the new legislation see innovation as having specific value that is embedded in international space law not to mention that the Outer Space Treaty itself is an example of legal innovation (160-160).

A counter to Blount and Robison’s argument could entail that what the International Space Station currently offers humans and nations is a remarkable and important opportunity to collaborate on shared scientific goals, mostly free from politics and almost entirely free from the influences of billionaires and their personal interests. The role of the station is research, and it’s the collaborative pursuit of knowledge in the interests of international, common humanity and united peoples, rather than the highest bidder. However, the current reality is that as the cost of access to low earth orbit continues to decline, more opportunities for commerce in space will emerge, with the industrialized countries and the neoliberal corporations at the helm.

Recommendations

It is evident from these anecdotes that space ethics are missing in the equation to ensure proactive policy making and implementation. The precarious situation in the lower earth orbit serves as a precautionary note to be indifferent to space ethics at a high cost. The tendency to wait until space problems have spiralled out of control as is the case with space junk in the lower earth orbit can be repeated or even be worsened in Mars or in the Moon if privatization and commodification of space continues the way it is going now. Also, if government administration agencies such as the United Nations office of Outer Space Affairs continues to fail taking heed of implementing proactive ethical space policies, then it is likely that we will be seeing the same trend happening in the lower earth orbit being passed on to other planets such as Mars, or the Moon. The over accumulation of satellites in the lower earth orbit is a typical reflection of the consequences of unregulated privatization and commodification of space use.

The International Space Station should be empowered through the United Nations Office of the Outer Space Affairs to provide space technological needs for all countries to avoid cluttering the lower-earth orbit with so many satellites. The current scramble for Mars colonization and Asteroid mining by private companies has the potential to lead to similar problems as those in the lower earth orbit. Elon Musk, SpaceX owner recently dumped a car in the orbit adding more to space junk while world citizens were cheering and clapping instead of reprimanding him for not making sure that he does not leave the car in orbit to be a space junk. The United Nations Office for Outer Space affairs which is set to govern the exploration and use of space for the benefit of all humanity: for peace, security and development did not issue a

statement against this incident yet the agency decries the over accumulation of space debris in the lower earth orbit.

Conclusion

This paper concludes that the next big space race is upon us and Outer space is no doubt the next frontier for colonization, privatization and commodification by humans. Currently large corporations and terrestrial billionaires are using their wealth and financial influences to push various countries to affect Space Laws for their own direct benefit. Collectively, citizens seem to be unaware that these billionaires, nation states, crowns or sovereignties are appropriating what the current United Nations Space Treaty, ratified by over 127 countries, states as rightfully belonging to the commons. Presently the U.S. political leaders have yielded to the pressure of these corporations and terrestrial billionaires; therefore, they have passed a new space law to allow the corporations to commodify the commons' space resources. However, this study concludes that privatization and commodification of Outer space raises red flags and it recommends that ethical policies that will govern the colonization, privatization and commodification of space should be proactively developed and be implemented without much delays.

This paper exposes the growing zeal in the plausibility of terraforming a planetary body (Mars especially) or planetary ecosynthesis; an initiative led by private companies such as SpaceX which launched Falcon heavy rocket into deep space this year proving its commitment to its visions of new space ventures (Carrington, 29-30). The research covers literature from different schools of thoughts. The paper unequivocally takes the stand that the prospects of privatizing and

commodifying space raise the need for clarity on ownership, accessibility, accountability and inability to participate arising for low-income countries, especially since the 1967 Outer Space Treaty which declares space as belonging to the commons is only persuasive and not binding. Thus, just as it happened on Earth, space developments are likely to be driven by morally deficient and behaviorally detrimental models of conquest if premised on the dogma that facilitated European genocide to indigenous lives across the world for the past centuries; however, the paper is hopeful that ethical frameworks of reflection such as global utilitarian, Kantian ethics and non-anthropocentric value ethics may hopefully be necessary to help ward off imperialism if they can be adopted for space developments.

Paramount to observe is that the paper evaluates ethical issues by directing our focus to normative questions of justice as fairness within the sphere of human interaction with space and how citizens of low income countries will potentially be included or excluded in the process. Important to highlight are the questions posed by the paper in respect to the passing of a new U.S space legislation. How will this legislation affect other countries? Would other countries follow suit by passing the same legislation or will the United Nations as an umbrella body itself amend the 1967 Space Treaty to open space commercialization as free for all?

The paper critically ponders the moral philosophy of private ownership of space for private commercial purposes. It recognizes that these actions do have moral agents behind them; therefore, much of its work principally looks at how these activities reflect on our moral values. It also touches the contingency of how space ethics would apply where the actors encounter new territories never touched by Earthlings and what our responsibilities would be to elaborate, non-living systems. Also important is the possibility that other living beings are present in space;

therefore, encountering extra-terrestrial life brings into question our ethical responsibilities in respect to the extraterrestrial intelligent life, biota and abiotic environment.

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