AN EXPLORATION OF ENVIRONMENTAL VALUES IN OUTER SPACE

by

MICHAEL AARON LINDQUIST

(Under the Direction of PIERS STEPHENS)

ABSTRACT

As technology and space exploration advance, philosophy needs to move with them, ideally addressing problems before they occur. This dissertation consists of three papers, each investigating an area of value theory situated within the context of outer space and explored from environmental philosophy. The first paper is concerned with the ethics of terraforming, interrogating whether unlived celestial bodies have moral status. In the first paper I argue that places like Mars and its systems have moral status grounded in two jointly necessary and sufficient conditions, namely, that such places lack of an external governing teleology and are irreplaceable. In satisfying conditions for moral status, it is therefore pro tanto wrong to terraform Mars – sufficiently strong reasons need to be provided for such a project, and it is not clear that such reasons exist. The second paper is concerned with planetary protection, especially wilderness protection. In the second paper I argue that on a modified account of Mark Woods's wilderness ethic, Mars and its systems manifest the value-adding properties of being natural, wild, and free. In establishing that Mars is wilderness, I then consider and expand on a proposal for planetary parks, proposing new areas for protection, criteria for boundaries, and design regulations for managing human presence on Mars in a way that attends to wilderness values. The third paper is concerned with the creation of permanent human settlements on other worlds. In the third paper I

argue that before settling other worlds, humanity must first address current social, political, and economic problems on Earth to ensure that we do not export such problems to new worlds. Exporting particular social modes to other planets will also serve to further empower, entrench, and exacerbate current problematic systems of hierarchy and domination. I argue that for a livable future wherein humans, animals, and the environment flourish we ought to embrace utopian solarpunk imaginings; however, it is unclear whether such future peoples would want to settle other planets.

INDEX WORDS: Philosophy, ethics, aesthetics, value, environmental philosophy, environmental ethics, environmental aesthetics, environmental values, space exploration, utopia, futurism, wilderness, parks, nature, Mars, solarpunk

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DEDICATION

To Mars

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CHAPTER 1

Introduction and Literature Review

Environmental philosophy has some serious roots at the University of Georgia (UGA). Indeed, the first conference on environmental philosophy was hosted at UGA in 1971 (Attfield 2021: 164). Fast-forward fourteen years to June of 1985 and the University of Georgia hosted what might have been the first (if not, one of the first) conferences on philosophy and space exploration at the Georgia Center. Organized by Eugene C. Hargrove with funding from the Program on Ethics and Values in Science and Technology of the National Science Foundation, the conference was entitled "Environmental Ethics and the Solar System," and included a presentation by Lamar Dodd, the namesake for UGA's School of Art (Hargrove 1986: VIII). The conference culminated in the publication of the collection *Beyond Spaceship Earth: Environmental Ethics and the Solar System* (Hargrove 1986).

Space exploration intersects with environmental ethics in substantial ways, hence the approach and title of this dissertation; however, others approach philosophical issues in space exploration from other areas, whether philosophy of biology in thinking about what may constitute life in the search for extraterrestrial life, philosophers of religion considering theological implications of extraterrestrials, or philosophers of science and technology approaching the topic from a more technical angle. After the publication of *Beyond Spaceship Earth* (Hargrove 1986), philosophical questions regarding space exploration have cropped up in the philosophical literature intermittently (for example, see Marshall 1993; Lee 1994, 1999; Sparrow 1999). More recently, philosophical literature examining problems associated with space exploration are emerging.

James S.J. Schwartz's 2011 "Our Moral Obligation to Support Space Exploration," published in *Environmental Ethics* (the journal started by Hargrove in his time as UGA (Attfield 2017: 167)) notes explicitly in their introduction that:

> The subject of space exploration has received a relatively small amount of attention in philosophical circles. Most of the discussion has been focused on practical issues: on what we may or may not do *if* we decide to explore the universe. Rather little philosophical attention has been given to the ethical and environmental *foundations* of space exploration. (Schwartz 2011: 67)

Since then, philosophy of space exploration has grown steadily. The first US-based philosophy organization focused on issues in space exploration, the Society for Social and Conceptual Issues in Astrobiology held its first conference at Clemson University in 2016 and has been meeting every other year since. Furthermore, the most recent meeting of the International Society for Environmental Ethics in the Summer of 2021 hosted two sessions on space ethics, where a portion of Chapter 2 of this dissertation was presented. This dissertation seeks to add to the literature on philosophy and space exploration, addressing some of the major questions in the field.

Chapter 1 of this dissertation serves to provide an accounting of the structure of the dissertation. Chapters 2 through 4 take the form of journal articles united by a common topical thread: the examination of philosophical problems that arise in the exploration of outer space.

Chapter 2 is concerned primarily with terraforming, a process of planetary engineering that would serve to reshape the environment of a celestial body such as Mars to make it hospitable for Earth-based life. I approach terraforming by analyzing what conditions are necessary and sufficient for moral status, that is, examining what properties afford something moral consideration in questions of good, bad, right, wrong, just, or unjust action. In this paper, I respond to pro-

terraforming arguments from James S.J. Schwartz (2013), building on the work of Keekok Lee (1994, 1999, 2003, 2005) and literature on irreplaceability/non-fungibility (For irreplaceability, see Grau; 2004, 2010; Cohen 2011; Matthes 2013; Stanhope 2021. For non-fungibility, see Nussbaum1995; Langton 2009) to develop an account of moral status. Chapter 2 concludes that Mars and its associated environmental systems have moral status based on satisfying two conditions set forth in the chapter, the Modified No-External Teleology Thesis and the Non-Fungibility Thesis. Absent sufficiently strong justification, terraforming Mars would be morally impermissible.

Chapter 3 is concerned primarily with the wilderness protection of extraterrestrial wilds. In examining the extraterrestrial environments, they seem to be paradigmatically wild places (I extend Mark Woods's (2017) wilderness ethic for the purposes of analysis). Wilderness values on Earth thus extend to wilderness places off Earth, therefore reasons for protection that spring from wilderness values extend to these places as well. I consider proposals for designated wilderness areas/parks on Mars, expanding them while providing further specification (Cockell & Horneck 2004, 2006).

Chapter 4 is concerned with the colonizing and settling of other worlds, determining what kind of future for humanity is worth striving for. I consider alternative visions of the future within opposing conceptions of futurism and utopianism provided by Murray Bookchin (2005), arguing we ought to aim for a solarpunk utopia, rather than a futurism that would perpetuate current, problematic modes of organizing society, politics, and economics. I conclude that humanity must first achieve utopia on Earth before settling Mars or other celestial bodies.

Chapter 5 consists of a conclusion, tying together themes from the preceding chapters and gesturing towards possible future directions of research.

CHAPTER 2

ASTROETHICS AND THE NON-FUNGIBILITY THESIS[1]

[1] Lindquist, M.A. Accepted by *Environmental Ethics*.
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ABSTRACT:

Terraforming is a process of planetary and environmental engineering that aims to wholly transform inhospitable worlds like Mars into places where humans and Earth-based life can live and thrive. In this paper I argue that it is morally impermissible to terraform lunar and planetary bodies by arguing for a novel conception of moral status. After critiquing pro-terraforming arguments made by James S.J. Schwartz, I then evaluate Keekok Lee's arguments against terraforming. Agreeing with Schwartz that Lee's position is insufficient, I develop an account of moral standing that borrows Lee's No-Teleology Thesis while positing my own Non-Fungibility Thesis to ground Mars's moral status. The Non-Fungibility Thesis is grounded in notions of irreplaceability as connected to intrinsic value and the conservative attitude explicated by G.A. Cohen. After developing the account, I make a further case for its overall plausibility by demonstrating its applicability to entities of moral concern besides celestial bodies.

I. Exploratory Ethics: Beyond Earth's Atmosphere

An increase in scientific understanding about outer space has led to proposals to reshape other worlds to create new ones. The dream is to make a space for humanity in outer space so we may one day travel the stars, have a home other than Earth, and preserve the apparent scarce life that exists in the universe. Mars, a small, terrestrial, red, cold, desert planet has become a site of creative imagination—a place where we could build a new home and have a so-called "planet-B." Terraforming is "a process of planetary engineering by which the extant environment of a planetary body is transformed into an environment capable of supporting human inhabitants," and a successful terraforming project would provide such a second home (Schwartz 2013: 1). Transforming an entire, inhospitable world into one that can host Earth-based life is an enormous, technological undertaking. Any project of this magnitude, especially one with such transformative consequences both for the planet and life itself, is worthy of deep philosophical exploration, especially as regards potential moral pitfalls. The primary question is whether terraforming is morally permissible, and if so, under what conditions? An initial attempt to answer the terraforming question with the philosophical resources of traditional moral theories likely yields a conclusion of moral permissibility with, perhaps, some dissent from some virtue ethicists. Accounts of moral status[2] afford Mars nothing, and on many accounts of what matters in environmental ethics, Mars still falls short, primarily because it is a lifeless place.

We ought not give in too hastily with such a massive project—disastrous science fiction narratives often serve as a warning against such alacrity. In response to this initial presumption in favor of terraforming, it is imperative to generate novel approaches to moral standing; we must

[2] By moral status I refer to the basic notion in moral philosophy concerned with whether a certain thing must be accounted for in moral decision-making (Jaworska and Tannenbaum 2021).

engage more creatively with morality's potential application to alien bodies and entire planets, especially those devoid of life. To these ends, the goal of this paper is to reconceive of the conditions for moral status in a way which concludes that terraforming is morally impermissible.

In their 2013 paper, "On the Moral Permissibility of Terraforming," James S.J. Schwartz defends a pro-terraforming position, critiquing the smattering of arguments offered against it while offering two arguments in defense of terraforming—what I will refer to as the "Weak Pro-Terraforming Argument" (WPTA) and the "Strong Pro-Terraforming Argument" (SPTA). Schwartz's two arguments vary in the strength of their conclusions: the WPTA concludes that terraforming is merely morally permissible, whereas the SPTA concludes that terraforming is morally required. Schwartz pairs the WPTA and the SPTA such that if one rejects the argument for the stronger conclusion, the weaker still may survive (Schwartz 2013: 7). Schwartz's (2013) arguments, especially the WPTA, represent a type of default line of thinking about the moral permissibility of terraforming, though in more recent work they remain cautious in prioritizing science before settlement (Schwartz 2019b, 2020), and there may be other, stronger arguments for terraforming out there. In Section II, I will argue against both the SPTA and WPTA, before developing an account of moral status in the subsequent sections that provides sufficient reason to believe planetary or lunar terraforming is morally impermissible.

My account will build on Keekok Lee's previous work on terraforming (1994; 1999). In Section III, I summarize Lee's conception of intrinsic value and her arguments against terraforming. In Section IV I engage with Schwartz's arguments against Lee and offer my own critiques of both Schwartz's critique and Lee's position. In Section V, I argue for a novel account of moral status, modifying Lee's No External Teleology Thesis (1999) and proposing my own Non-Fungibility Thesis, thus partially grounding Mars's moral status in its irreplaceability. After

arguing for the Non-Fungibility Thesis and demonstrating its applicability to the question of terraforming Mars, in Section VI I will establish the account's further plausibility with regards to other denizens of the universe that we often may intuitively believe belong in the moral community. Section VII will conclude with a summary and reflection on future developments needed to further support the account.

II. Terraforming: the SPTA and WPTA

I divide the issue of terraforming into two types of cases: (1) The Lived Terraforming Case, and (2) The Unlived Terraforming Case. Here, "lived" and "unlived" correspond to whether such cases involve places with life—Lived Terraforming Cases may allow the application of our current, traditional moral theories (e.g., Kantian deontology, act and rule consequentialism, virtue ethics, care ethics, many kinds of pluralism) to specific cases of terraforming. So-called "Lived" cases of terraforming still would be difficult to deal with; if the celestial body under examination for terraforming contains life, perhaps terraforming at the very least likely would be impermissible, if it might kill what life there is, barring perhaps extreme circumstances.[3] Issues in the "lived" cases still present many challenges—the moral status of extraterrestrial microbes who would be or are threatened by humanity's adventures in space is a live topic of discussion (e.g., Cockell 2004; Milligan 2015; Cockell 2016; Smith 2016). Our moral thinking, especially in environmental thought, is often friendly to life, and theories that traditionally center individuals may apply in focusing on the moral standing of individual bacterium, or even speak of ecosystems of bacteria. "Unlived" cases deal with the completely lifeless places that populate much of the known universe,

[3] Additionally, the lived and unlived cases dichotomy does leave out questions about places where we simply do not know if life exists or not, but before any project such as terraforming is undertaken, understanding whether it is lived or unlived should be a priority.

such as Moon or, as far as we know, Mars. In "On the Moral Permissibility of Terraforming," Schwartz (2013) contains their critique of the anti-terraforming literature to Holmes Rolston, III (1986), Alan Marshall (1993), Keekok Lee (1994), and Robert Sparrow (1999), who all attempt to deal with the unlived case in their respective works.[4] Biocentric theories, abound in environmental ethics, clearly have at least something to say about the lived cases, but unlived places appear to be much more common in the universe than lived ones (Schwartz 2013: 3).

Schwartz's (2013) arguments in favor of terraforming can be framed as ones with conclusions that might be intuitively appealing to most people, especially the WPTA, though the reasoning offered may be centered more on the goods of extending humanity or resource exploitation; furthermore, the defeat of the SPTA and WPTA does not imply these alternative arguments fail, though if Mars is shown to have moral status in its own right, then such reasoning may face significant challenges. I will consider each argument in turn, rejecting them both before developing my alternative account.

The SPTA is as follows:

Strong Pro-Terraforming Argument

(P1): Terraforming "would contribute to our environmental education [regarding Earth's environment]."

(P2): "Humans are obligated to increase their awareness of and knowledge about Earth's environment."

(C1): Therefore, "terraforming…is morally recommended insofar as it would contribute to our environmental education [regarding Earth's environment.]" (Schwartz 2013: 7)

[4] Notably, Schwartz expresses being "somewhat less critical" of Sparrow (1999) and Lee (1994) now than they were in the 2013 paper (2020: 139, specifically footnote 12).

Schwartz admits if one were to reject (P2), that alone would not rule out the possibility of Terraforming's moral permissibility—it simply would not be recommended. While Schwartz has the weaker conclusion of the WPTA (mere moral permissibility) to fall back on, it is still worth assessing the strengths and weaknesses of the SPTA before moving on to the WPTA.

On grounds of deductive validity, the SPTA is invalid, as it is possible for both premises to be true and the conclusion false; if the truth of (P1) and (P2) is assumed, the conclusion does not follow necessarily. If terraforming would contribute to our collective environmental education (which it almost certainly would), and if humans do have an obligation to increase their environmental knowledge, there might be other countervailing reasons to *not* terraform, such as monetary or resource costs, if not moral or aesthetic costs. These other reasons may thereby render the conclusion false even if the premises were true. These other kinds of reasons thus need to be accounted for.

The above critique suggests a stronger version of the argument. The first premise of the SPTA seems true and will not be contested here, but the obligation asserted in (P2) needs further refinement, as potential moral ills need to be accounted for in the search for knowledge; just because some action may fulfill an obligation to gain knowledge within a particular domain that we have an obligation to gain knowledge in does not imply any and all activities that might provide such knowledge are permissible—other obligations may take precedence, and we also may include the space environment within our conception of the environment (Weston 2009c). (P2) seems dubious at best, and Schwartz does not offer much in the way of a defense of it, but rather "presumes" it (Schwartz 2013: 7). Still, there are worries to be had with its current formulation due to its wide permissiveness were the SPTA to be accepted. If reformed to be its strongest self,

it is not clear that the much-needed revisions to (P2) would conclude with a recommendation of terraforming. A modified construction of (P2) could read:

> (P2') "Humans are obligated to increase their awareness of and knowledge about Earth's environment" through methods that minimize or sufficiently mitigate harms (or appropriately attend to competing obligations, reasons, etc.), where 'Earth's Environment' is to be understood as not only the planet and atmosphere of Earth, but also other celestial bodies (e.g., Mars, Moon, and Sun) that are in relationships with Earth that affect Earth.

(P2) as modified to (P2') is still problematic. Terraforming would destroy and replace the Martian soil and atmosphere, radically alter its geological and hydrological systems, etc. A terraforming project on Mars would likely violate (P2') by hindering our ability to know more about the natural history of Mars; terraforming would render some historical facts unknowable. Furthermore, even with the modification, as the knowledge that could be gleaned from terraforming likely could be achieved through experiments and observations on Earth, it is not clear that terraforming would satisfy the harm clause of (P2'). Thus, even if (P1) and (P2') are true, the issue of the SPTA's validity still is not rectified. Based on the SPTA's failings, I will move to consider the WPTA.

The WPTA arrives at a weaker conclusion than the SPTA, though the argument is still suspect. The WPTA could be constructed as such:

> *Weak Pro-Terraforming Argument*
>
> (P1) An action, Φ, is morally permissible unless we have good reason to believe it is morally impermissible.
>
> (P2) We have no good reason to think the act of terraforming is morally impermissible, based on the extant literature.

(C1) Therefore, we have good reason (for now) to believe terraforming is morally permissible. (Schwartz 2013)

The general principle explicated as (P1) seems reasonable, metaethical quibbles aside regarding whether our having good reasons or not is what *makes* something morally permissible or not. The truth of (P2) as it stands hinges on the nature of the extant literature and whether Schwartz has adequately shown it to be wanting; however, it is odd to hang without qualification whether we have good reason to believe something or not on the status of the current literature, whether it be some moral or amoral proposition.[5] Regarding deductive validity, the WPTA fails like the SPTA. Consider that a person may, for example, have good reasons to believe terraforming is morally impermissible, and thus morally wrong—this would be consistent with the truth of (P1) according to its corollary contrapositive; however, those reasons may not be represented in the extant literature. For those that have good reason to disagree with the conclusion, the conclusion's being true would put an unjustifiable epistemic burden on that individual; such a person would, presumably, *not* have good reason to believe terraforming is morally impermissible, thus the conclusion would be false in such an instance. For a concrete example, consider this very paper as it is being written—I will be offering an argument for the moral impermissibility of terraforming below, but as it is being written it is not yet a part of the extant literature (even consider the account in the idea stage before even being written). Also grant that the author at present concurs with Schwartz regarding the insufficiency of the accounts in the literature, granting the truth of P2. For a case where one is arguing terraforming is morally impermissible according to a view not in the literature, perhaps especially because they find the current literature insufficient, the author would

[5] Different fields of study may call for different standards for the legitimacy of such appeals to authority. While such appeals may be proper in, say, discussions of climate change or evolution (areas where perhaps consensus is a meaningful aspect of knowledge production), they may not be appropriate for questions of moral permissibility.

not have good reason to believe terraforming is morally permissible. Therefore, the WPTA is deductively invalid.

Based on the invalidity of the two arguments offered by Schwartz considered above, the SPTA and WPTA, supporters of terraforming will have to look elsewhere for arguments in its favor. Others argue in favor of terraforming in part on the basis of perceived material benefits, but Schwartz offers straightforward arguments that may be representative of those who tend to favor the scientific endeavor and greatly value knowledge-generating activities.[6] The next sections will work up to the generation of an outline of a novel conception of moral status meant to provide good reason to believe terraforming Mars would be morally impermissible in at least most cases, such that sufficiently strong reasons are needed for it to be morally permissible or excusable.

III. Lee's Intrinsic Value: A Summary

Keekok Lee (1994) attempts to subvert standard biocentric ethical theories by putting forth her own account of the value of Earth without centering its being lived. S uch an account is intended to be separate from mere biological considerations. In constructing her account in this manner, she hopes to be able to extend such a theory to planets that are devoid of all biota. S he concludes that terraforming is morally impermissible, that one ought to approach things such as Mars with "awe and humility," and that such an approach entails her conclusion. Lee argues by positing three theses for which, if something satisfies all three, that thing is concluded to possess intrinsic value. If issue is taken with the term "intrinsic value," she also offers the term "human-independent value." Lee's methodological orientation is towards thinking it is "human and

[6] Notably, since their early work on terraforming, Schwartz has published much on philosophy and space exploration, including a book, *The Value of Science in Space Exploration* (2020). Here, Schwartz highlights the value of scientific knowledge and prioritizes this value in space activities, calling for forbearance in resource exploitation and settlement for reasons of scientific exploration (Ibid.).

biocentric chauvinism" that are arbitrary in their denial of value to that which does not fall under their limited scope, asking why one ought to assume valueless-ness instead of value (Lee 1994: 100).

It is my intention in this section to summarize Lee's conception of intrinsic value. I plan to borrow from Lee, so a thorough review of her three theses is necessary for further argumentation. Lee's conception of intrinsic value rests on three theses, each argued for separately but jointly recommending certain attitudes and behaviors to take towards others, specifically, non-human nature and, especially, planets devoid of life like Mars. Lee's three theses are the following:

(1) No-Teleology Thesis

(2) Autonomy Thesis

(3) Asymmetry Thesis (Lee 1994: 92–93; for an updated account, especially of the No-Teleology Thesis, see also, Lee 1999: 172–177)

A thing satisfies the No-Teleology Thesis if it "did not come into existence and/or continue to exist to serve human purposes" (Lee 1994: 92).[7] Coupled with this is a rejection of Aristotelian conceptions of teleological nature. Biotic nature has grown and developed alongside humanity but not for human purposes. The No-Teleology Thesis certainly applies of Earth itself, as it has existed for a *much* longer time than humanity. This claim also holds true for planets or other celestial objects that have come into being and developed without human purposing, so Mars and Moon clearly satisfy this criterion.

[7] Notably, this is the formation of the No-Teleology Thesis from Lee's 1994 piece; Lee's later work is discussed and modified for my purposes in Section IV, but as this piece is particularly aimed at terraforming and Schwartz engages with it, it is worth focusing on the 1994 work before moving to Lee's later work (see, Lee 1999, 2003, and 2005) where she further specifies the No Teleology Thesis instead as the "No External Teleology Thesis" (Lee 1999: 208, see specifically note 28).

A thing satisfies the Autonomy Thesis if it possesses autonomy, here understood "…to mean no more and no less than its ability to exist, to function integratively and well without any reference to, assistance from or reliance on humans" (Lee 1994: 93). Complex natural systems, natural processes, or even natural objects such as rocks or trees would likely persist without humanity. Lee argues, insofar as we, *Homo sapiens*, satisfy some ecological niche, such a niche could be filled in our absence by something else, and most likely something less destructive than us that allows for natural processes to manifest more strength and diversity, seeing as many current human lives are often complicit in the hindrance of the flourishing of other life and natural systems (Lee 1994: 93). In short, planets and their natural systems do not require us and are thus autonomous.

The Autonomy Thesis leads to the Asymmetry Thesis, which incorporates dependency relations. Humankind depends on the Earth, but Earth does not depend on us; the planet will be here long after humans are gone.[8] In a one-sided dependency relation, where X is dependent on Y, but Y is not dependent on X, X is not justified in asserting superiority over Y. This is, however, what Lee claims we do when we assert our moral superiority over nonhuman nature in claiming that we, humanity, possess intrinsic value but nonhuman nature does not.

Lee summarizes her conception of intrinsic value as such:

> (a) whatever is autonomous and independent of humans both in its genesis and continuing existence has a value independent of humans; (b) whatever is autonomous and independent of humans is not there primarily to serve human purposes and ends, and therefore exists for itself—although humans may and do, as a matter of fact, find it is of use to them. (Lee 1994: 99)

[8] Assuming, of course, something does not take us both out at the same time, like aliens needing to clear space to build a hyperspace bypass (Adams 1979).

The assumption of value takes the place of the assumption of valuelessness: Lee assumes things have value rather than things are valueless, and this forms the theoretical basis of her conception of intrinsic value, as most of those things that are separate from humanity's valuation and existence appear to have intrinsic value on this conception. This assumption echoes Thomas Birch's (1993) ethic of universal moral consideration, wherein everything is assumed to have value until it is proven otherwise (see also, Weston 2009b: 95).

On Lee's account, celestial bodies like Mars or Moon that satisfy the three theses would have intrinsic value. Mars, she concludes, satisfies these three conditions—it does not have a teleology, is autonomous on her definition, and our relation is asymmetric in that absent Mars's gravitational pull on Earth, Earth would orbit closer to the sun, resulting in more solar energy reaching the planet's surface, increasing the temperature of the planet to, possibly, levels too high for human life to exist or flourish (Lee 1994: 98). From satisfaction of the Autonomy Thesis and Asymmetry Thesis in particular, Lee makes her moral recommendation: humankind ought to approach objects that have intrinsic value with *awe and humility*. She conceives of awe as reverential fear and wonder. Such an attitude towards entities like Mars, which satisfies these conditions and thus warrants such an approach, is justified primarily on the grounds of our asymmetric relation to it and its separateness from us (Ibid. 94).

Awe and humility, in the context of Lee's three theses are supposed to justify a principle of non-interference, thereby concluding that terraforming would be morally impermissible. The only kind of interference Lee permits is knowledge generating activities that, importantly, keep a respectful distance from the celestial body; she permits scientific satellites to enhance our understanding Mars, but "any attempt to go beyond cognitive understanding would constitute a violation of our recognition that it has a value entirely independent of ourselves which ought to

constrain any impulse we may have to make it over to our own design…" (Lee 1994: 98). Under these conditions of moral permissibility, it seems also to follow that the Moon landing and sample collection may be judged as morally impermissible for Lee. Our landing as a "giant leap for mankind," along with planting a flag on the moon resembles more of an act of conquest and a testament to the technological prowess of humankind, rather than awe or humility.

IV. Lee: A Critique via Schwartz and Myself

Schwartz, in arguing for the moral permissibility of terraforming argues against multiple accounts of its moral impermissibility. Keekok Lee is one of their targets, and they respond to the account summarized in the previous section. Schwartz's critique is short, but some points are worth making note of. Their first line of attack is on (3), the Asymmetry Thesis. They admit that, perhaps it is the case that humans do depend on Mars to keep us from orbiting too closely to the sun, but such a dependency has nothing to do with the surface features or atmosphere of Mars. While it might be good reason to not "blow Mars to smithereens," it fails to be sufficient reason to refrain from terraforming (Schwartz 2013: 18). Schwartz also provides a brief critique of Lee's conception of humility, claiming a terraforming project may be undertaken that is still humble; we may be humble in the face of the power of such chemical and physical processes that are necessary for sustaining life as we know it (Schwartz 2013: 19).

Considering their critique of the Asymmetry Thesis, Schwartz imagines Lee could retreat, and maintain that the other two theses are sufficient to prohibit terraforming; however, they maintain it is really the Asymmetry Thesis that does the heavy lifting with regards to humility, so without it, humility is ungrounded (Schwartz 2013: 19–20). Humility is justified in virtue of our dependence, but without dependence on Mars's atmosphere, humility towards it is inappropriate—

in fact, we would realize dependence on Mars's atmosphere only through terraforming and settlement. With humility eliminated, Schwartz still allows that awe or wonder still may be appropriate attitudes towards "pristine Mars" (Schwartz 2013: 20). Schwartz argues that a thing's being awe-inspiring is insufficient for grounding a sufficient principle of non-interference to preclude terraforming. As awe is based upon the "scale and complexity" of something, Schwartz employs the counterexample of the global economy as something with scale and complexity that inspires awe but is morally permissible to interfere with; in fact, interference may sometimes be morally required (Schwartz 2013: 20).

The example of the global economy is an odd counter to Lee's position. While Schwartz considers Lee may be able to argue that one is natural and the other not, such that naturalness is the key difference, they deny she has given sufficient reason or explanation about how naturalness can play this normatively transformative role (Schwartz 2013: 20). Schwartz errs in not considering stronger moves open to Lee under her approach, such as the work her No-Teleology Thesis or Autonomy Thesis may be able to do—the global economy has been created by humans and would fall flat without humans; instead of making some appeal to naturalness as the important difference, retorting that the global economy fails to satisfy these other theses would be the manner for discharging the alleged counterexample. The global economy exists because of humans and for human purposes—humans made it and it (supposedly) serves human interests— and it only continues to function through human action. Therefore, the global economy does not satisfy Lee's conception of intrinsic value, and thus does not warrant non-interference.[9] Still, the connection

[9] Interestingly, the global economy seems to fail Lee's No-Teleology Thesis as well but does so while not being an artifact because, according to Lee, artifacts are the material embodiment of human intentionality (Lee 2003: 4), and taking the notion of embodiment seriously, thereby stipulates "intentionality must be embodied in a material medium" (Lee 2003: 35, see specifically note 1); it is unclear that the global economy satisfies this requirement.

between a thing's being awe-inspiring and a policy of non-interference requires further exploration.

Separately from Schwartz I still find good reason to reject Lee's Autonomy Thesis as phrased in her 1994 piece. Lee's account of autonomy is clearly incompatible with the intrinsic value of humanity. Humans rely on humans for their ability to exist, survive, thrive, and flourish; our social nature, complex systems of cooperation, etc., cause humankind to fail to satisfy Lee's Autonomy Thesis. The cost of Lee's conception of autonomy and intrinsic value comes with a theoretical price: she could develop two accounts—one for individual persons and one for environments—but this creates an onerous weighing/priority problem between an ethical theory that is concerned directly with weighing the intrinsic value of humans against the intrinsic value of nonhuman nature that satisfies her three theses. Lee develops her conception of autonomy as it relates to nature in her 2005 work, "Is Nature Autonomous?", where she expands to a disjunctive account that allows for something to be considered autonomous if it is self-generating and self-sustaining, which is an improvement for those that prefer positive accounts to negative ones; however, without further clarification it is not clear the positive account addresses the worry raised above.

In constructing my own account of moral standing, I will be adopting and adapting Lee's No-Teleology Thesis as one of two jointly necessary and sufficient conditions, the second to be explicated in the next section. Keekok Lee's No-Teleology Thesis seems to adequately capture something important: those things with intrinsic value are those things whose genesis and continued being is, in some sense, for their own sake. Humans exist for their own sake, and those things that have a genesis separate from human purposive creations and moldings also exist "for their own sake"—trees do not exist so we can sit in their shade, much in the same way that mice

do not exist so owls may eat. Importantly, Lee, in moving from her 1994 piece to her 1999 view responds to criticisms by further specifying the No-Teleology Thesis into the "No External Teleology Thesis" (172–177). She thereby distinguishes notions of internal/immanent telos, which may comprise the good of an individual organism as Rollin highlights (1998: 162) and external teleology impressed upon individual organisms (Lee 1999: 173–174); in drawing these distinctions, Lee also introduces a distinction between notions of "by itself" and "for itself" (Lee 1999: 172–177; 208, specifically note 28), equating the latter with a maintenance of functional integrity and the former with an independent genesis from humanity—that a being "has not come into existence, nor does it continue to exist **in order to** serve human ends or purposes" (Lee 1999: 174, emphasis in original).

In situating fulfillment of the No External Teleology Thesis as one of two conditions for moral status, further defense and modification of the thesis is warranted. In Lee's work on artifactuality, technology, and genetic engineering (see, for example, Lee 1999, 2003, 2005), she argues transgenic organisms[10] are biotic artifacts, and the imposition of an external teleology robs them of their status as natural. While Lee conceives of the natural and the artifactual as lying on a continuum, transgenic modification is, she argues, so extreme—so deep into the building blocks of reality—to make the organism as artificial as a "plastic toy" (Lee 1999: 52–54; Preston 2013). For Lee, the depth of the modification resulting in the transgenic animal renders them biotic artifacts, as they have an external teleology impressed upon them such that they fail to satisfy the No External Teleology Thesis (Lee 1999, 2003, 2005).

[10] Defined by Lee: "[B]iotechnology today can create what are called transgenic organisms whose genomes have incorporated genetic material from another organism belonging to a totally different species, be it plant or animal – in other words, such a technology can cross both species and kingdom boundaries" (Lee 2003: 2).

One may find such conclusions from Lee counterintuitive, as a lot of the properties that one might think make animals matter still would be retained by a transgenic animal, such as the ability to feel pain, pursue preference satisfaction, have some kind of autonomy, etc. Indeed, organisms as described above still have their own wills and may even actively resist or overcome certain external tele that are impressed upon them, though perhaps with sufficient time. Furthermore, whether willed or non-willed nature, they retain a degree of "creativity," "self-directedness," and spontaneity—certain tele may not manifest as cleanly as the ticking of a clock, and others are auxiliary to their self-directed natures. One of the primary examples Lee uses in her work is that of transgenic cows and sheep that have been engineered to produce a protein in their milk for human consumption that they would not normally produce (2003; 2005). While, indeed, such a transgenic cow or sheep would not have come into existence without human manipulation or interference, and was designed with a specific purpose in mind, that a genetically engineered organism's milk contains engineered protein for human consumption is not central to the cow's own life, goals, or self-generated tele; the organism still exists "for itself" (Lee 2003: 21). If anything, the impressed external telos only *appears* central due to the external environmental conditions and constraints into which they are forced.

Therein lies one of the risks of Lee's No External Teleology Thesis as construed: in conceptualizing such organisms (or perhaps some environments) as being defined by such external tele, we fail to recognize the importance of the internal capacities they still retain, approaching Weston's warnings of a self-validating reduction (Weston 2009c). There does, however, remain a question of centrality of these external tele. Indeed, the transgenic cow's milk protein is only one fact about that cow, and one made more apparent by the repressive and oppressive character of many of the environments in which they might be found, but the cow's self-generated tele,

consciousness, personality, sociality, etc. (and other facts about them that may entail fulfillment of the Non-Fungibility Thesis argued for in the next section) inculcate the transgenic cow with other tele (which, again, their environments often frustrate) such that a reduction to artifact is ill-applied. If, as Lee argues, artifacts are "the material embodiment of human intentionality," (Lee 2005: 64) it is unclear that transgenic animals are necessarily artifacts, as they embody more—much more—than mere human intentionality; human intention plays a part on the makeup of a transgenic organism but may not be the crucial or essential feature of that organism's being. The teleology thrust upon them by their genesis fails to be governing.

The conception and use of Lee's No External Teleology Thesis I employ here still uses gradable, background notions of naturalness and artifactuality, but further specifies the kind of external teleology. The modified version of the No External Teleology Thesis reads:

> A thing satisfies the modified "No External Teleology Thesis" if it did not come into existence or continue to exist to serve human purposes with a governing external telos.

The disjunctive form of the modified No External Teleology Thesis allows for convenient capture of biotic and abiotic elements, whereas the notion of a governing external teleology better captures differences between common artifacts and beings with/generating internal tele, which in some ways may also better capture some sense of autonomy separate from Lee's Autonomy Thesis. A further treatment of the natural as related to the artifactual is certainly warranted, as there is much left to say, especially in dealing in-depth with Lee's extensive commentary on the topic (1994, 1999, 2003, 2005), but this would require a discussion of further depth than space permits. The next section argues for the second condition for moral status: the Non-Fungibility Thesis.

V. My Proposal: The Non-Fungibility Thesis

My account is intended to be, primarily, an account of moral status. This account will have only one other condition in addition to a modified version of Lee's No External Teleology Thesis: The Non-Fungibility Thesis. To avoid ambiguity, moral status and intrinsic value will not be used interchangeably; ultimately, a distinction between the two concepts is imperative to the approach, as having intrinsic value of a certain sort will ground irreplaceability (satisfaction of the Non-Fungibility Thesis), which will then partially ground moral status in conjunction with the No-Teleology Thesis. The extra explanatory power of an account of irreplaceability or non-fungibility will allow this account to, at least in part, respond to critiques of intrinsic value accounts of moral status, such as Schwartz's critique of Rolston's (1986) account (Schwartz, 2013: 13–16). The rest of this section will be focused on explicating and defending the Non-Fungibility Thesis. This conception of moral status primarily will be applied to terraforming, as that is the question I am concerned with at this juncture, but I will also briefly consider wider application of this account in Section VI to demonstrate its plausibility, in part by establishing that this account also captures much of what a moral theory ought to intuitively capture as regards the moral community. In reconstituting moral standing, I would like to press the boundaries in attempting to recognize Mars specifically, elevating irreplaceability as a condition for full moral standing in tandem with the modified version of Lee's No External Teleology Thesis. This account of moral status is comprised of two conditions that are jointly necessary and sufficient for full moral status. They are:

1. The Modified No External Teleology Thesis (hereafter, NETT)
2. The Non-Fungibility Thesis (hereafter, NFT)

This account has only two principles and applies to non-human natural environments, individual nonhuman animals, and humans, while also justifying a moral injunction against terraforming. It is my intention to outline the NFT, providing an analysis and defense of this criterion for moral status.

This account takes some inspiration from Martha Nussbaum's cluster conception of objectification. Fungibility occupies the fourth spot on the list of attributes of the cluster (Nussbaum 1995). Nussbaum is primarily concerned with the multitude of ways in which it is okay to treat objects, but especially those ways we treat objects that would be, in most cases, morally problematic to treat a person; such an instance would be a case of morally impermissible objectification. Nussbaum defines fungibility as when "the objectifier treats the object as interchangeable (a) with other objects of the same type, and/or (b) with objects of other types" (Nussbaum 1995: 257). Rae Langton, in expanding on Nussbaum's conception of objectification elaborates on her cluster, using language that better provides a description of when one is objectifying another because, as Nussbaum herself admits, "[o]ne is treating *as an object* what is really not an object, what is, in fact, a human being…Treating *things* as objects is not objectification…objectification entails making into a thing, treating *as* a thing, something that is not really a thing," (257, emphasis mine). Nussbaum's wording fails to capture the way that, at root, objectification treats *subjects* like objects. Langton (2009), in making Nussbaum's work more precise, better captures this attribute when defining fungibility as when "one treats [something or someone] as interchangeable (a) with other things of the same type, and/or (b) with objects of other types" (228–229). Talk of objectification here may seem odd when considering Mars or other lifeless places in the universe. To clarify, I will *not* be subjectifying Mars such that objectification is the moral error made when terraforming, rather I will argue that the

irreplaceability—the non-fungibility—of Mars, partially grounds its moral status in a way that would preclude terraforming.

A thing is non-fungible, and thus satisfies the NFT, if it is *not* interchangeable with other things that are relevantly similar or of the same type. I will argue Mars possesses moral status because it satisfies both the NETT and NFT. Mars clearly satisfies the NETT: it did not come into existence for a particular purpose. Lee (1999) argues the NETT holds for Mars and, furthermore, Schwartz agrees when commenting on the earlier 1994 piece, so hopefully this application is uncontroversial (Schwartz 2013: 18). So, in what sense might Mars be non-fungible, and thus satisfy the NFT? In some relatively straightforward, perhaps folk sense of what is replaceable and what is not, Mars is intuitively irreplaceable, but clarifying a detailed notion of the concept is essential to providing a justified account of why being irreplaceable or non-fungible matters morally or grounds a thing's mattering morally.

There are at least two accounts of irreplaceability or non-fungibility[11] worth examining here in developing the notion for use in determining whether something has moral status: (1) an account that is merely metaphysical or (2) one that is value-based. I will first briefly examine the metaphysical account of irreplaceability and find it unsatisfactory for partially grounding moral-status, then I will develop values-based account of irreplaceability.

I take it as obvious that some things are replaceable with other things, and some things are not. As Martha Nussbaum argues when examining objectification and fungibility, for the purposes of writing a letter, a pen may be as good as a pencil, and a word processor may also be a suitable substitute (Nussbaum 1995: 258). Other things seem to not be replaceable, for example, Van

[11] I will use "irreplaceable" and "non-fungible," ironically, interchangeably. This is in part due to drawing inspiration from Nussbaum and Langton who talk of non-fungibility, and then interacting with work from Grau (2004; 2010), Cohen (2011), and Matthes (2013), who speak instead of irreplaceability. For my purposes here, I take them to be equivalent.

Gogh's *Starry Night* cannot be replaced by a poster from the museum's giftshop. One might argue the irreplaceability of *Starry Night* is grounded in its uniqueness—there is only one *Starry Night* after all—but having the status of "being one of a kind" is insufficient for grounding irreplaceability, for if someone wanted to write a letter and only one pen exists, yet there are thousands of pencils, the pen is still replaceable.

The ends for which one is concerned with the object in question may determine its replaceability. If someone wanted to preserve the existence of the sole pen in the universe for posterity's sake, then a pencil would not be a suitable replacement or, if the ends are specific enough irreplaceability is achieved: imagine the letter writer wants the letter to be written in pen and there are no other pens than the one available—in this case, a pencil would not be a suitable replacement—the pen becomes non-fungible. And presumably if one does not care about seeing *Starry Night* the painting itself, but merely wants to have some idea of what it looks like, assuming they had never seen it or some representation of it before, then a giftshop poster would do just fine, as would a Google image or even perhaps a brilliant forgery, and so *Starry Night* is replaceable in these instances for these ends. Thus, the ends with which one is concerned seem to dictate whether something is fungible/replaceable or not, in at least some instances.

A brief outline of the conditions regarding fungibility/replaceability for these instances would be:

Some object X is ordinarily replaceable or fungible if the following joint necessary and sufficient conditions are met:

1. Our intentions towards object X are functional in nature (i.e., we are concerned with using object X for some end, Z).
2. The functional intention is *not* preservationist in nature.

3. There is some object Y that would also satisfy the functional considerations regarding Z.

Correspondingly, some object X is *not* ordinarily replaceable or fungible if the following joint necessary and sufficient conditions are met:

1. Our intentions towards object X are functional in nature (i.e., we are concerned with using object X for some end, Z).
2. The functional intention *is* preservationist in nature or there is *not* some object Y that would also satisfy the functional considerations regarding Z.

By "preservationist," I refer to concern for the existence of some thing—concern *that* a particular thing exists; such a case would be like the one above where the concern for the pen is simply its being (whether we consider preservationist intentions to be mutually exclusive with function-oriented intentions is a separate issue, but one I believe might reduce down to a linguistic matter).

The previous cases have been concerned with human artifacts: pens, pencils, word processors, paintings, posters, etc. The objects themselves were designed, and thus teleological in genesis; however, with the employment of Lee's NETT alongside the NFT, I can limit the scope of cases I will need to consider and will now move to considering non-teleological things, Mars specifically.

Practically, we would have a hard time replacing Mars with another planet. Even if we could, the other planet would not *be* Mars even if it were very alike Mars and could fulfill Mars's gravitational role in our solar system. There is only one Mars, so there may be at least an initial presumption in favor of non-fungibility concerning this case. On the face of things, Mars is unique and irreplaceable practically speaking, as we cannot at this point construct a copy of Mars, and even if we could, it would not *be* Mars—much like a replica or a forgery it would lack a list of

historical features we may find important: it may be unnatural, younger, etc. (Matthes 2013). So, Mars itself fulfills the NFT as far as practical fungibility/replaceability is concerned; there is nothing with which we could really replace it. But being *practically* non-fungible or *practically* irreplaceable is insufficient on which to hang something like moral status, as what can be done practically is a contingent matter and a robust account of moral status would stand on sturdier grounds. If something is contingent, then it is not sufficient grounding for moral status or intrinsic value. Practical irreplaceability/non-fungibility is contingent. Therefore, practical irreplaceability/non-fungibility is not sufficient grounding for moral status or intrinsic value.

It is worth enumerating the kinds of changes that would occur if a terraforming project were initiated as this is the case with which I am primarily concerned. With terraforming, the atmosphere would be massively altered in both content (more O_2) and density, seasonal cycles changed, soil modified to grow crops, etc. Terraforming on a (Martian!) global scale would change Mars entirely, which is exactly the point of such a project. Mars has a unique character, one that is not fungible with other places: a trip to Death Valley, the Sahara, the Grand Canyon, or Mount Everest, is not fungible with a trip on Mars to Valles Marineris, the Martian ice caps (Vastitas Borealis or Planum Australe), the Hellas Impact Crater (Hellas Planitia), or Olympus Mons. And being on Earth is not the same as being on Mars in part because Mars is so different—it is its own unique particular. There is a certain specific and peculiar character to Mars—one that would be irrevocably changed were humans to terraform; Mars would be different and forever so be. This is to say nothing of the scientific value of leaving Mars much as it is, especially as understanding Mars's natural history could tell us much about planetary development and death.[12] The actual physical features of Mars, such as its atmosphere, its weather patterns, its geology, soil structure

[12] Schwartz's work highlights the role of scientific value and knowledge in space exploration. See especially, Schwartz 2019a, 2019b, 2019c, and 2020

and composition, and a history of those features (collectively, the field of areology) as being *only* teleomatically derived, not teleological (i.e., satisfaction of NETT), would all fundamentally change under a terraforming program; it would no longer be *Mars*, as something else will have taken its place. So, what properties are essential to Mars's being irreplaceable, i.e., what makes Mars, Mars?

Certain basic properties, while uniquely Mars's, seem not to say much about Mars the place or the environment of Mars that would be altered through terraforming; that Mars stands in a certain gravitational relation to Earth, is the fourth planet farthest from Sun in our solar system, and other standard spatiotemporal facts or properties are empty ones for grounding moral status, lest we approach moral status attaching to all things in virtue of their spatiotemporal uniqueness, resulting in a moral theory for which useful moral recommendations are wanting (see, for example, Birch 1993; Schweitzer 2017). Such properties enlighten us as to why Mars is how it is, but fail to capture the specific things about Mars that would be changed that some might reasonably want to protect—those aspects of Mars that might be under threat of destruction were the planet to be terraformed.

Moral value or moral status is linked with notions of irreplaceability, i.e., that some thing's having full moral status makes that particular thing uniquely worth preserving, protecting, or not destroying—this is helpfully highlighted in Nussbaum's inclusion of fungibility within her cluster conception of objectification (1995) and Langton's further elucidation of it (2009). This link may be justified, as irreplaceability commands us normatively (though perhaps only with moral weight in conjunction with the satisfaction of the NETT). Consider, for example, human persons. While individual humans may be replaceable under certain end-oriented conditions, to view the person *qua* person as replaceable by another seems an error, one that is not merely metaphysical but moral

(see, again, Nussbaum 1995; Langton 2009). Furthermore, we also find irreplaceability arise in the context of discussions of love, which also highlights the importance of the particular involved above and beyond the mere values attributed to that thing; both Christopher Grau (2004; 2010) and G.A. Cohen (2011) provide superb examples regarding these cases. Grau (2004) also provides excellent (and humorous) analysis on the irreplaceability of at least some nonhuman animals in his treatment of the "Missiplicity" cloning project undertaken at the University of Texas (Grau 2004: 111–113); the irreplaceability highlighted by Grau is underscored by the hurt one experiences after the death of a companion animal when another person suggests merely replacing the animal with a substitute, e.g., "just get another dog."

Minimally, things that are irreplaceable make demands on us—*Starry Night* may, for example, due to its irreplaceability in certain respects, give us reason to not destroy it, draw on it, burn it, melt it, or paint over it. But why? Because there is no real good substitute and *Starry Night* is valuable historically, aesthetically, etc. Namely, it is the *only* source of particular values, ones inherent to the object or its relations of which it is a part that its replicas fail to possess, and we rightly value the individual bearer of values above and beyond the mere values that make it valuable. *Starry Night* is not replaceable with any other artwork of equivalent beauty, historical importance, artistic significance, monetary value, etc.

G.A. Cohen grounds a thing's irreplaceability in two ways: first, in the intrinsic values that a particular thing has, embodies, etc., or, second, in its being personally valued as a particular by a particular valuer (Cohen 2011: 206). I will focus on the former of the two, as the language arguably aspires to objectivity in a way that the latter centers one's subjective orientation towards particular objects. Cohen contrasts intrinsic value with extrinsic value rather than instrumental value, thus he is speaking of values in the thing itself, but not necessarily of moral status; the values

involved that generate normative consideration need not be moral ones—the values that may call on us for consideration could be aesthetic or historical. Many of Cohen's examples engage objects that have aesthetic or historical significance, and minimally, a thing's irreplaceability provides a *prima facie* reason to not destroy that particular thing, perhaps echoing W.D. Ross' ethical theory (Ross and Stratton-Lake 1930; Ross 1939)—we would have a permanent, excellent reason to not destroy something with intrinsic value, whether aesthetic, historical, etc., should regret its loss, weigh reasons for its preservation against other competing reasons, etc. This position thereby also recognizes and endorses a value pluralism, an important aspect for what could be said to be ethical discourse at an originary stage.[13] Cohen also notably expresses that attitudes often taken when thinking something is replaceable are reprehensible, writing "[i]t is essential that some things should be *taken* as given: the attitude of universal mastery over everything is repugnant, and, at the limit, insane"—comments certainly relevant to a terraforming project and the virtue of humility (Cohen 2011: 207, emphasis in original).

Following Cohen, a thing is irreplaceable if it has intrinsic value, i.e., particular things that have intrinsic value ought to be preserved as "the particular *bearers* of value… [this is] a commitment to the conservation of *what has value*" (Cohen 2011: 210, emphasis in original). Contextually, Cohen (2011) is arguing in opposition to views that focus on producing or maximizing value simpliciter, echoing Tom Regan's (1983) critique of consequentialism—that it reduces individuals to "mere receptacles" for value (205); such views, it is alleged, maintain the individuals themselves do not matter as individuals, but rather the intrinsic values of, say, pleasure

[13] According to Anthony Weston, originary stages focus on "the development of values: stages at which new values are only beginning to be constituted and consolidated" (Weston 2009a: 31). Originary stages challenge the orthodoxy of current structures of value, birthing radically new ideas and forcing both values and common morality to adapt. For ethical theory in outer space at an originary stage, ethical theorizing needs to be open to shedding biocentric biases: it may turn out to be the case that Mars or Moon have such moral status, and thus our current ethical theories will need major revision. Schwartz also writes on originary stages and the need to move past biocentrism (2016; 2019c).

and pain do (Regan 1983: 205–231; Cohen 2011: 210–213). The conservative attitude Cohen defends, which I am adapting to the task of grounding moral status, serves as a means of recognizing and attending to particular *things* of value. The particular thing is thus irreplaceable because of the intrinsic values that attach to it but is not thereby reduced to those values. Thus, if Mars has intrinsic value (as distinct from moral status), then it is irreplaceable and valuable as the unique bearer of value that it has.

In his treatment of conservatism, Cohen is not explicit about what kind of thing intrinsic value is, nor which values he believes qualify; however, considering the work that responds to or builds on Cohen's, as well as the examples he provides, it is fair to infer he considers intrinsic value quite widely: a thing may have historical value, aesthetic value, social value, etc. (for more work on Cohen, including expansions and critiques, see Matthes 2013; Brennan and Hamlin 2016; Stanhope 2021). When concerned with Mars, minimally, it can be said to have historical and aesthetic value, as well as scientific value. As far at the metaphysics of value is concerned, I see no reason to commit to anything in particular or to hastily limit the scope of this approach, thus how one wishes to conceive of intrinsic value is open, and the approach thereby may be flexibly incorporated into several coherent accounts: whether one wants to conceive of intrinsic value as something more metaphysically real, something relational, something who's existence is intuitive or self-evident, something in need of a proper paraphrase[14] to be sensible, etc.—any sufficient

[14] Here I have in mind something to the effect of a means of talking about intrinsic value without ontological commitment to intrinsic value as a thing that exists "out there" in the world to avoid alleged "spookiness." Such paraphrases, roughly formulated, could be of the sort: "To say an object has, say, aesthetic value, is to say the object has such and such natural properties that, upon recognition of those properties with the appropriate aesthetic attitude/attention, we necessarily rightly judge the object as being aesthetically valuable or a source of aesthetic values." Such paraphrases may appeal to those that prefer metaethical naturalism or cognitivism while also not offending "the aesthetic sense of us who have a taste for desert landscapes" (Quine 1948: 23). I see no reason such paraphrases would fail to account for what Cohen or myself are attempting to capture, especially if they refer to naturalistic properties/qualities of things, whether objects or processes, emergent relations, states of affairs, etc.—the properties that make the object valuable are still tethered to the object in some significant way, even if they are borne out by some relation or other. One promising option in line with a kind of ontological conservatism of the sort outlined

account will do so long as there is one, and I am happy to assume that there is. As such, terraforming would constitute a change that would destroy much of the character of Mars and its environments; respecting Mars's character, undergirded by those features that give rise to its aesthetic or historical value would entail respecting it as it is, rather than forcibly altering it for Earth-based life; its unique characteristics brought about by billions of years of geological, atmospheric, or hydrological processes ought to be allowed to continue to allow Mars to develop, change, generate, create, etc. If Mars possesses certain unique beautiful natural forms, as Sean McMahon (2016) suggests, aesthetic considerations also will constitute a significant part of the relevant features of Mars; as Tony Milligan ponders, "After all, who could study Mars and wonder at its landscape for years but then regard is as *simply* a big reddish rock in space?" (Milligan 2015: 31, emphasis in original). Historical value also would include the natural history of Mars, something worth humbly exploring and appreciating through careful and respectful scientific engagement (Schwartz 2020). Insofar as Mars and its systems have these values, along with perhaps the value-adding properties of wilderness as elucidated by Mark Woods (2017)—Mars being a place that is wild, natural, and free—they elevate Mars, its spaces, and systems to irreplaceability as well. In conjunction with Lee's NETT and Mars's satisfaction of it, Mars and its systems thus qualify for full moral status and thus, *pro tanto*, deserve, maximally, preservation and, minimally, consideration within moral deliberations. The normative demands that Mars and its systems thus make on us go beyond mere aesthetic obligations that we may have to, say, not destroy a painting, but advance to the moral.

This account of moral status would thus entail that terraforming is at least *pro tanto* morally impermissible. Mars and its systems would be sources of value that, in being valuable, become

above also may be the further development of a Fitting Attitude Theory of Value (see, for example, Rabinowicz and Rønnow-Rasmussen 2004; Jacobson 2011).

valuable above and beyond the values that reside in them. Terraforming would constitute a destruction of Mars and would thus destroy the object of such intrinsic value. Even if it were the case that terraforming would increase the aesthetic value of at least some Martian environments, that fact alone would not serve as a sufficient reason for grounding the moral permissibility of terraforming, analogous to Cohen's case in which destroying some painting to create a more beautiful one does not serve as sufficient reason for the destruction of the original (Cohen 2011: 213). An account that foregrounds irreplaceability offers a defense of Mars against pro-terraforming accounts that might appeal to other material goods or values that might be created through such a project—we at least have good reason to leave Mars as it is, and the values those reasons are grounded in may be sufficient for fending off such proposals—there is something good about leaving Mars as it is, and the reasons offered for terraforming have to be suitably strong, beyond mere economic or exploitative considerations, to pass muster. Adequately strong reasons would need to be provided for the destruction of an entity with moral status, and it is not clear that such reasons obtain in the case of terraforming for reasons of economic development, or even perhaps colonization when other possibilities remain. Perhaps truly *imminent* destruction or extinction may be sufficient reasons, but a genuine and careful considering and weighing of reasons appropriate to the context and scenario would be required (imminent here is so construed to exclude scenarios in which terraforming technological advancements can be used for potential emergency geoengineering on Earth). Let us not abandon our home so hastily for such beautiful yet inhospitable spaces.

VI. Establishing the Plausibility of the NETT + NFT Account

I have thus far argued Mars and its systems fulfill both the NETT and NFT, thereby attaining moral status; however, to provide a fuller accounting of this theory of moral standing and establish its plausibility as an account, it is necessary to outline how the conditions may apply beyond Mars to things that we might understandably want to capture within the moral community. In this section I will outline how this account may apply to other ordinary subjects of moral consideration or concern, though a more thorough exploration of its application is certainly deserved.

Considering things that satisfy the NETT, they can be divided between conscious nature and non-conscious nature, as things that are natural in origin are non-teleological, whereas artifacts are often not (I say often here because artworks may be, in some cases, complicated).[15] Examples of conscious nature might be humans and many non-human animals. Examples of non-conscious nature might be ecosystems, soil, rivers, or individual natural objects such as individual trees or blades of grasses. Certain complex processes particularized or localized to constitute an environment and its character also qualify as meeting the NETT, such as geological, meteorological, climatological, and hydrological processes.

First, I will consider conscious nature: human and non-human animals. Humans are non-fungible owing to their uniqueness as individual persons. Being conscious experiencers of the world makes one unique in that one's own experiences are their own and are not shared by any other. Only one can have the particular experience of some particular thing happening—this is

[15] By "conscious" I mean something very basic—that the thing possesses a phenomenology, and as such there is "something it is like" to be that thing. Whether there is something it is like to be a certain thing (say, a bat, to use Thomas Nagel's [1974] famous example) is separate from whether we can know *what* it is like to be that thing. Determinations of which denizens of the universe possess a phenomenology I leave open, and the account maintains a degree of flexibility that should be able to adapt to future findings.

subjectivity at its base (some sense of personal history also may be at work here). Such experiences and individual subjective thoughts, beliefs, mental states, etc. constitute a significant proportion of one's self-identity, making it the unique self-identity that it is. Such uniqueness makes such beings non-fungible: you are not replaceable by another human being (Grau 2004; 2010). Furthermore, such a condition obtains for most, if not all, non-human animals, thereby ensuring that nonhuman animals also constitute a part of the moral community, at least as moral patients; nonhuman animals qualify as having full moral status as they straightforwardly fulfill the NETT and similarly fulfill the NFT, insofar as they also possess a phenomenology. Architectonically, this could be clarified in a variety of ways: (1) satisfaction of the NFT is disjunctive—it can be satisfied by (a) having intrinsic value or (b) possessing a phenomenology, or (2) possessing a phenomenology could be the grounds for some other intrinsic value—perhaps some sort of experiencing value or a more classical accounting of interests, preferences, dignity, etc. Barring any serious concerns with either account, which option one finds more amenable may be rooted in the weight one gives to theoretical or explanatory virtues—(1) is perhaps more ontologically conservative but (2) is more theoretically simple via the reduction of the disjunction.

Non-conscious nature has been, classically, trickier to account for in moral theorizing, but to make a case for a dead planet's moral standing and the moral impermissibility of terraforming, such places need to satisfy the NFT, especially if this theory of moral standing is to be the grounding for the development of a serious environmental ethic. Potential candidates for non-conscious nature that must be considered with regards to the NFT are (1) individual natural objects and (2) larger systems.[16]

[16] I rely here on a kind of folk-ish distinction between the two, so the language need not be taken too strictly. If one wants to argue for a kind of "all is process" ontological approach, I think distinctions of the sort made above are still tenable, whether ontologically or phenomenologically.

Individual natural objects would be things such as a tree, a rock, a leaf, etc. and appear to be fungible with one another in the practical sense—if I want to make an American Oak barrel for bourbon aging, some *Quercus alba* tree is just as good for that purpose as at least some other *Quercus alba* tree. Still, this is to consider these objects in a way that would have their moral mattering be contingent. Lacking a phenomenology in some relevant sense, an individual tree is also unlikely to be "uniquified" in the same way possessing a phenomenology works for conscious nature. It seems as if most natural objects are in fact fungible with some other natural object in a practical sense. Fungibility may not hold for all natural objects, such that particular natural objects may satisfy the NFT via the accumulation of certain values. For example, particular old growth trees or individual flowers of an endangered variety might satisfy the NFT. A decrease in their population (and, correspondingly, genetic diversity) inhibits their flourishing, thus making them rarer, and thereby less likely to be fungible with some other individual of that variety, as certain individuating aspects about their genetic information "single them out" in a way; notably this account would favorably accommodate talk of the value of biodiversity. Additionally, especially with older natural objects, whether trees, flowers, or rocks, each might derive some irreplaceability from their corresponding historical values. Admittedly, this line of argument concerning individual natural objects needs further explication; however, concern with wider systems and environments is where we will run into our celestial bodies, such as Mars, and there seems to be a viable path forward as far as the application of this account of moral standing to these objects of concern of activists and environmental philosophers.

Environmental ethics often leans on a biocentric bias at its center. Admittedly, on Earth at least, the biocentric bias makes sense in a practical way; philosophers and activists are primarily concerned with animals or environments that are alive or, at the very least, have significant living

parts. In considering ecosystems as bearers of moral value, the biocentric bias tags along, as definitions of ecosystems often emphasize the relationships between communities of living organisms and the abiotic elements of their surrounding environments, sometimes with "environment" being defined as the place in which things live, thus redoubling the biocentric bias (for helpful histories of the development of the ecosystem concept and the beginnings of ecology, see Attfield 2021: 101–121; for a discussion in relation to the wilderness concept, see Woods 2017: 149–180). Biocentrism, however, will have to be ejected if lifeless planets are to count morally (Schwartz 2016; Schwartz 2019c; Weston 2009d). If ecosystems are traditionally tied to life, as well as conceptions of natural environments, we need to be clear about what is really under consideration when conceptualizing what may matter about Mars. We might be said to instead be concerned with a four-dimensional spacetime region that includes dynamic systems activity exemplified by geological, atmospheric, or hydrological processes that are made manifest in their partially determining the character of a place or environment. Such a "thing" (system, process, emergent state of affairs, etc.) as it were, can include biological processes of ecological growth and evolution, but need not, and thus opens the door for Mars. So, is a four-dimensional spacetime region that includes dynamic systems activity exemplified by geological, atmospheric, or hydrological processes that manifests environmental character non-fungible? Mars seems to be partially constituted of such things, and so is Earth or any sizable celestial object that could plausibly be terraformed.

Systems, such as ecosystems or the dynamic environmental character generating systems described above, also are not fungible. While particular trees may be replaceable, the destruction of an ecosystem fundamentally changes the land and the character of a place, sometimes such that,

despite great effort, it cannot be reproduced or, if it can be, certainly not easily.[17] This seems to be an issue in wilderness discourse as well—it is held by some that, in a turn of popular phrase, "wilderness is not a renewable resource" (if it is to be considered a resource at all), though renewability and fungibility are admittedly different, the sentiment is similar (see, for example, Elliot 1997).[18] A tree may be replaced by another tree of the same species or, possibly, one of a different species that would fulfill the same ecological niche, but as ecosystems change and climate conditions change, ecosystems are, at the very least, not fungible—their change represents, in some cases, a destruction—new ecosystems emerge and, even if new ones are of the same or greater value (aesthetically, historically, etc.), something is still lost—the "individual" bearer of those values is different. Some changes may be just that, alterations to the ecosystem, and others more representative of a death (e.g., desertification). The ontology of ecosystems is tricky for other reasons as well—they seem to be vague entities with vague and permeable borders, especially when considering atmospheric processes. One could consider ecosystems one-by-one or, owing to their vague boundaries, extend to planets and a larger planetary ecosystem to bypass these ontological concerns—this approach would simplify consideration of Mars, but oftentimes more fine-grained distinctions are helpful, whether for activism, scientific operationalization, or community and cultural identities. Regardless, ecosystems, whatever they are, give a certain place

[17] A quick note regarding ecological succession is warranted as a fuller account of the NETT and NFT in practice is still forthcoming. Natural succession is not necessarily morally problematic even if some ecosystem satisfies the NFT. Even if an ecosystem meets the NETT and NFT, there is no duty to preserve it *as it is at any particular time slice*. In fact, there should not be. Ecology is growth and process, and the kind of "freezing in time" that would follow from that brand of preservationism would be anti-ecological at its core. Of concern is replacement through human and institutional action, as things that can be held morally responsible and the preservation of environmental values and systems (Woods 2017: 149–180).

[18] There is certainly more to be said on the implications of this accounting of irreplaceability and specific details regarding environmental protection and rewilding. For example, Cline (2020) essentially argues for the value of biodiversity in terms of "irreplaceable design." For example, we might think that axolotls, are an irreplaceable evolutionary form and thus worthy of protection. Prospects of de-extinction complicate matters, as do issues in philosophy of biology (see, for example, Lindquist 2020).

a particular character, and if a different ecosystem takes hold, or even if some significant changes occur, the character of the place changes. When humankind enacts changes that destroy ecosystems to create new ones, something irreplaceable has been lost and an inequivalent alternate is left in its place.

VII. Conclusion

In this paper I have argued for a novel conception of moral status that builds off Keekok Lee's work, as well as that of many others. I have proposed and defended the NETT and the NFT as joint conditions that must be satisfied for a thing to have moral status, with the NFT being satisfied by a thing's being irreplaceable, with irreplaceability grounded in intrinsic value and a conservative orientation towards such value. Such a conception shows that terraforming other planets or moons is morally impermissible; however, there are further issues to consider. As it currently stands, the NETT + NFT account of the nature of moral status needs further development, both metaethically in terms of classic debates regarding the nature of intrinsic value, and its application in the context of a more filled out normative theory. The NETT and NFT, *prima facie*, would seemingly apply to most, if not all, conscious life, at least capturing those things as mattering as well. They also may be able to apply to ecosystems and environments, while allowing for resource use, seeing, for example, at least some trees as fungible with other trees. At base, things with full moral status are, *prima facie*, worth protecting by their satisfying the two conditions elucidated in this paper, and good reasons are needed for their destruction; our presumption should thus be for their preservation, not exploitation. Whether such reasons can be presented remains yet to be seen, but Mars's having moral status allows for a separate line of

argumentation against terraforming than ones focused on, say, the use of Earth's resources and whether such a project is worthwhile.

CHAPTER 3

WILDERNESS VALUES IN OUTER SPACE[19]

[19] Lindquist, M.A. To be submitted to *Ethics & the Environment*.

ABSTRACT:

In this paper I consider whether Mars and its associated environments qualify as wilderness for, if they do, then reasons pertaining to wilderness value and wilderness protection thereby extend beyond Earth. Through a critique, modification, and subsequent application of Mark Woods's (2017) wilderness ethic, conceiving of wilderness as a significant location of the value-adding properties of being wild natural and free, I argue that Mars, in qualifying as wilderness, ought to be protected as such. In response to this conclusion, I then consider a planetary park proposal put forth by Charles S. Cockell and Gerda Horneck (2004, 2006). Finding their proposal insufficient, I propose further parks and conditions for drawing boundaries, as well as explicate ways in which the preservation of wilderness values on Mars may constrain the construction of future settlements or science stations.

I. Introduction

As space exploration continues, environmental philosophy, which has typically centered on Earth, will need to expand to outer space. Some relatively recent literature has proposed setting up a planetary park system for limiting human (and robot) encroachment on certain areas of extraterrestrial bodies; such a proposal would delimit areas of, for example, Mars or Moon, as wilderness areas to not be developed, despoiled, etc., for the purposes of fulfilling potential obligations to extraterrestrial lands, future generations, aesthetic value, scientific value, and historical value (Cockell & Horneck 2004; 2006). Other proposals focused on resource mining have set a one-eighths limit on resource use, such that mining, extraction, and development industries may only use one-eighths of the resources of the solar system, with the rest left alone as wilderness; such a limit set before the expansion of the extraction industry is supposed to limit potential growth ahead of actual growth, such that humanity is not left attempting to curtail resource exploitation after its exponential growth has ran beyond control (Elvis & Milligan 2019).

Wilderness philosophy has a long history within environmental thought and has served as the impetus for direct action (Abbey 1993; Foreman 1993) and governmental policy (Attfield 2020: 91–99). But a question arises: will our conceptual schemas within environmental philosophy survive the trip? Whether Mars and its environments count as wilderness is contested (see, for example, Weston 2009: 164–166), but if wilderness is a meaningful idea beyond Earth's atmosphere, then thinkers and activists may be able to use the wilderness literature and associated values in advocacy and policy discussions. Furthermore, interrogating the applicability of wilderness to outer space environments allows for additional conceptual refinement and theoretical unity or simplicity. Therefore, it is worth examining whether extraterrestrial environments may be wilderness.

If we are to consider the applicability of the wilderness concept of outer space, there also remain several insightful critiques of wilderness and its usefulness more generally that are worth addressing. In Mark Woods's *Rethinking Wilderness*, he addresses seven strands of anti-wilderness arguments, incorporating insights of the critiques into his wilderness conception while also finding each flawed. Key to this approach is a dismissal of purity notions of wilderness and thus the recognition that wilderness is a gradable concept, rather than some "pristine," "untouched," or "virginal" place (Nash 2014: 1; Woods 2017: 21). Recognizing the gradable variation in wilderness and wilderness values, while employing important distinctions such as that between impacting and trammeling (Woods 2017: 114) or the humanized and that under human control (116), allows for a subversion of purity accounts, as well as for recognizing meaningful differences between environments. The details here also allow Woods to respond to "everything is nature" positions (Woods 2017: 39–64) and the social-constructionist, "no-wilderness" positions (65-92). Woods further details how we might address some of the particular problems with how wilderness protection and wilderness areas are managed (149–180; 211–238), as well as how environmental protection initiatives, whether those establishing wilderness areas or national parks, have impacted or ignored the plights of people, whether in the environmental justice movement (181–210) or through imperialism and colonialism (123–147). Woods rightly recognizes that the "untouched" notion of wilderness unjustifiably erases a history of genocide and displacement of native peoples from their ancestral lands on the North American continent, and that a proper accounting for and consideration of this history is essential to rethinking wilderness, government designations, and future land back/decolonial politics. The detailed and historical accounting done by Woods in *Rethinking Wilderness* is, in my view, largely successful at synthesizing insights from

wilderness advocates and wilderness critics in pointing towards a way forward while defending the role of wilderness in environmental thought.

If Woods (2017) is right in his conclusion that "the concept of wilderness is a meaningful concept, and the practice of wilderness preservation is a worthwhile goal" (266), then in considering outer space, the next question is, as posed by Anthony Weston, "[h]ow much of our existing conceptual equipment–how many of our moral and environmental categories–are up to the trip?" (Weston 2009: 165). Weston himself harbors some doubts, specifically regarding the applicability of the concept of wilderness:

> The rugged hills of Moon are both strangely familiar and yet *unearthly*. If 'wild' means, in part, self-possessed, 'untrammeled,' or sublime, then surely all of this is paradigmatically wild too. Yet that term does not quite work either, and it is only partly because these extraterrestrial 'wilds' are so far off the scale of anything terrestrial. We are concerned with 'wilderness' on Earth partly because such places are under siege…when wild places really are in danger, staying out makes sense. That the same kind of restrictiveness applies to entire unexplored and unpressured worlds is not so clear. (Weston 2009, 166, emphasis in original)

It is not clear why being so big may be something challenging for wilderness. Certainly, as is in line with the Wilderness Act (1964) a minimal standard makes sense, such that a one centimeter by one centimeter area of land may not qualify, but not a maximal standard (how might one even determine one?). Further, as humans and robots extend out into the solar system, bringing with them trash and the special risk of biocontamination, some worlds are under threat or may be in the near future.

Under a conception of wilderness such as the one outlined in The Wilderness Act in the United States, it seems as if most if not all extraterrestrial worlds would qualify as wilderness under the Act, with the notable excision of the federal land designation (1964). The Wilderness Act's problematic conceptualization of wilderness as being "where man himself is a visitor who does not remain," arguably acts in a Terran context to erase indigenous people that lived in areas now designated as wilderness, does in fact apply to space. In attempting to retain some conceptual unity, it is important to use some notion of wilderness that applies both terrestrially and extraterrestrially, and not reinsert this aspect of old notions of wilderness when considering these places where humans are indeed visitors, and possibly always will be. While the "untouched" notion of wilderness may extend to certain places within the solar system, such that this notion of wilderness may seemingly have a place in our universe, it would miss many of the areas we currently demarcate as wilderness on Earth. If wilderness is to be a useful notion terrestrially *and* beyond, a notion of wilderness that spans contexts will be helpful to such exploration. Furthermore, as Alan Johnson (2020a) rightly points out, a frontier mentality has not been conducive to protection of the frontier; such an approach to unused land ultimately leads to its destruction (so-called "development"), and so we ought to approach Space with a rejection of "the final frontier" frame (80).

In Section II, I summarize Mark Woods's concept of wilderness and the wilderness values developed in his *Rethinking Wilderness* (2017). In Section III, I explore the potential for Martian application of Woods's account, expanding it to shed its biocentric biases as they "may not be up to spaceflight" (Weston 2009: 166). Section IV introduces the planetary park proposal by Charles Cockell and Gerda Horneck (2004; 2006). Section V critiques and expands on the planetary park proposal from the previous section, proposing new boundaries and envisaging possible protection

policies. Section VI concludes with a summary and an outline of future work to be done on extraterrestrial wilderness.

II. Mark Woods's Wilderness Ethic

Mark Woods, after defending the idea of wilderness from its critics while adapting the spirit of their critical insights, retains that "wilderness is significant because it is a location of the value-adding properties of naturalness, wildness, and freedom" (Woods 2017: 238). Woods details these value-adding properties positively, avoiding notions of purity. In this section, I will detail Woods's account; while Woods intentionally limits the scope of his discussion to Earth and not extraterrestrial wilds, my goal in the next session is to detail this extension (Woods 2017: 8).[20] Wilderness, on Woods's account is the "active presence of the untrammeled other-than-human world," and it is "significant because it is a location of the value-adding properties of naturalness, wildness, and freedom" (Woods 2017: 116, 238) . To fully understand the account, I will provide a brief sketch of what is meant by "untrammeled" according to Woods, as well as what is meant by the value-adding properties Woods argues for and how they interact.

The language of "untrammeled" appears in The Wilderness Act (1964: 2). Woods, referencing the *Oxford English Dictionary*, writes that "the verb 'trammel' connotes a hindering of free action or the act of confining, fettering, hampering, impeding, or putting restraints upon something" (Woods 2017: 107). Making use of the notion of trammels avoids making mere human presence problematic, rather, the issue then becomes one of human *domination* of a landscape with its cultural and material forms. In further elucidating this point, Woods distinguishes

[20] I do not fault Woods for how he limits his focus. His thorough accounting of the history of wilderness preservation and engagement with Earth-centered critiques of the concept and its history is essential groundwork to be done in taking the concept outwards from Earth.

"trammeling" from "impacting," as one can impact another by having or causing an effect on another, without trammeling another, which would constitute that more serious "confining, dominating, fettering, impeding, restraining, or shackling" (Woods 2017:114). Further, we may think that things that have been significantly impacted by humans have been humanized but not controlled, for example, Earth's weather and climate have been humanized because of human inputs, but they are hardly under human *control* (116). This distinction also further contributes to how we may think about a further difference between notions of control and participation, wherein humans may occupy some natural area but participate in its processes without exerting the kind of trammeling control or domination the land (115-116). Furthermore, trammels may disappear with time – they may not last forever (107; 118). Woods focuses on positive conceptions of wilderness and its associated values, centering his notion of wilderness not "as the mere absence of people but instead as an active presence of the untrammeled other-than-human world" (116). Thus, mere presence or human effects pose no problem for a place's being wilderness necessarily – only when human presence and effects elevate to the level of trammels do we begin to have a problem for wilderness. Next, I will explain Woods's notions of the value-adding properties of naturalness, wildness, and freedom.

First, naturalness. Woods assesses naturalness both ontologically and values-wise. Ontologically, Woods avoids a categorical or purity notion, concluding in accordance with Robert Elliot (1982; 1997), Piers Stephens (2000), and Helena Siipi (2005), that naturalness comes in degrees. As I've argued previously, many scientists and laypersons conceive of and perceive naturalness as coming in degrees (Lindquist 2020). So, such a conception is a common one, and we are rightly skeptical of those accounts that would invoke purity conceptions that would conclude that there is no wilderness or nature. Thinking of naturalness in positive terms Woods

defines naturalness as "*having a genesis and causal history characterized by other-than-human biological, chemical, ecological, and physical forces*" (Woods 2017: 248, emphasis in original).[21] A thing's being natural, or minimally being perceived as natural, changes how we see the whole object due to the way naturalness situates the object or environment in a more-than-human history; as Ronald Moore states, "[t]o perceive something as a product of nature is not to perceive one more thing about it; it is to change the way we perceive everything about it" (Moore, 2004: 218). Appreciators of nature often find value in its spontaneity, its being other-than-human – the ways in which it can surprise us and its genesis as something humanity did not create. This is partially why walking through a beautiful European garden versus a wilderness area affects us so differently aesthetically – one is more natural than another, even if the garden has "natural parts," their genesis in the forms they take is evident of human moldings, and so the experience of wilderness is different in part by the degree of naturalness and its linkage to the past. Naturalness is to be contrasted with the artifactual (Woods 2017: 262).

Second, wildness. Woods, again to avoid negative definitions considers wilderness as "more than set[ting] an oppositional context to ourselves" (Woods 2017: 252). Wildness importantly incorporates "other-than-human autonomy," whether that of nature itself or other-than-human animals (Woods 2017: 253). Woods conceives of wildness as "*a capacity for authentic, autonomous, and spontaneous expression*" (Woods 2017: 255, emphasis in original). Wildness is explicitly associated with spontaneity, though not exclusively, as naturalness also imparts notions of it as well. Wildness is to be contrasted with "civility, domestication, or tameness" (Woods 2017: 262). Wildness is also gradable, much like naturalness, such that there are no problematic categorical dualisms at work here either; one thing may be more or less wild

[21] "Other-than-human" here is to be contrasted with the usual negative term "non-human."

than some other thing. The built in gradeability of Woods's notions of naturalness and wildness avoids purity conceptions of wilderness that invoke a "one-drop-rule," resulting in the non-existence of wilderness resulting from any human impacts or global climate change. Wildness is also an internal capacity, whose expression is found in the third value-adding property, freedom. This internal capacity, much like some notions of autonomy, also thereby finds itself as something that can be retained even if the external capacities for its expression are limited; while a caged lion is unfree, they may still be manifestly wild.

Third, freedom. Woods, in explicating what it means for a wilderness to be free, states that "*other-than-human freedom means a lack of external constraints or controls*" (Woods 2017: 260, emphasis in original). Freedom is to be contrasted with "the bound or the confined" (Woods 2017: 262). The focus on freedom is thus on an absence of conditions that would prevent expressions of wildness. Again, the caged lion is unfree because their external environment is such that they cannot run with other lions, hunt with other lions, etc. Wilderness not only contains things that are wild, but also allows that expression free from "*external* constraints or controls." Wilderness, in being nature, naturally puts some constraints on action from a material standpoint, e.g., if there are no gazelle, the lion cannot hunt gazelle, if there has not been any rain, they cannot drink, and if there are no mates, they cannot have offspring.[22]

If these three notions seem to run together, it is because they do to some extent. According to Woods, they "are practically interlinked in various combinations" (Woods 2017: 262). Further, they have a "symbiotic" relationship: when all three are present in an environment "they combine

[22] Notably, much of the anti-purity conception of wilderness can be found in the work of Val Plumwood in her *Feminism and the Mastery of Nature*, writing that:

> A theory of mutuality which acknowledges both continuity and difference provides an alternative way to view wilderness, recognising it as the domain of the uncolonised other…It is a domain where earth others are autonomous or *sovereign*, free to work things out according to self-determined patterns…'Wilderness' is not a place where there is no interaction between self and other, but one where self does not impose itself. (Plumwood 1993: 163-164)

in ways that are mutually advantageous to each other" (263). Naturalness, wildness, and freedom of the kind described by Woods have may be found in places other than wildernesses, but wilderness areas (*de facto*, not necessarily *de jure*)[23] serve as significant locations of these value-adding properties and their symbiotic synthesis; the connections between these value-adding properties and wilderness is not a necessary one, as other entities, places, and processes may embody these same value-adding properties (Woods 2017: 263). But are Mars and its various environments reasonably characterized as possessing or expressing the value-adding properties of being natural, wild, and free as Woods conceives of them such that they qualify as wilderness? In short, yes, but not without some modifications to Woods's account.

III. Woods's Wilderness Ethic with Martian Modifications

Woods's account of wilderness and its associated value is a promising one – it's nuanced and captures much of what we intuitively find valuable about wilderness and wilderness experience while also being accommodating of the various insights of wilderness critics; however, as it currently stands its applicability to Mars is suspect, in large part owing to some of its biocentrism. What follows is a Martian "tune-up" of Woods's wilderness concept and values to apply to terrestrial Mars while retaining its application to terrestrial Earth.

First, naturalness. Mars existed long before humanity and, depending on how things go, may continue to exist in its own way long after. Mars's genesis and continuance is characterized by other-than-human forces; however, Woods's definition of natural may need further modification in part due to its conjunctive form: "*other-than-human biological, chemical, ecological, and physical forces"* (Woods 2017: 248, emphasis in original). The chemical and the

[23] For details on this distinction and its role in wilderness discussions, see Woods 2017:35.

physical certainly fit Mars – various chemical and physical forces are clearly at work; however, depending on our conception of the biological or ecological, naturalness may not so easily apply. Let us assume that there is no life on Mars, and thus that there are no biological forces on Mars.[24] Without the biological, the ecological need not apply. Systemic definitions throughout the history of ecology have included the biotic as an essential part, whether Ernst Haeckel in 1866 speaking of ecology as "the science of relations between an organism and its environment," or the following (super)organismic models, community models, density-dependent population models, or ecosystem models, they all share the common biocentric thread from Haeckel, though centering particular aspects of that relation or working with different conceptual schemas (Attfield 2020: 103–121; Woods 2017: 154–160). Even lacking life, Mars is still, in genesis and continuance, of the other-than-human. While it is characterized in part by chemical and physical forces, those forces themselves are expressed in part, and further specified by, geologic, hydrologic, lithospheric, cryospheric, and atmospheric processes, all of which over time culminates in an environment with a particular character separate from human trammelings. Mars seems fundamentally natural, despite its lack of biota, in part because of its relevant *natural history*, the sense of naturalness being employed here by Woods (for a history-based accounting of (un)naturalness, see Siipi 2008). Furthermore, lack of biota also seems to imply, counterintuitively, that there is no ecosystem on Mars until we step foot on it ourselves (or send some poor, other-than-human animal there). Whether such counterintuitive implications of the ecosystem concept are issues to be rectified through reconceptualization or paradigm shift in the

[24] If life is found on Mars, then this becomes a non-issue for Mars at least; however, this problem could then be extended to other celestial objects beyond our solar system or within, whether Ganymede, Titan, Mercury, or Venus. Further, perhaps one could argue that there are biological forces on Mars since the term "forces" is itself somewhat ambiguous; one could argue that the presence of rovers represents human forces on Mars, and thus our biological being is a force on Mars even if from afar.

science of ecology as the study of space environments advances, only time will tell. Woods's conception of naturalness may be modified to a disjunctive form, reading, "having a genesis and causal history characterized by other-than-human forces, such as but not limited to biological, chemical, ecological, *or* physical forces." The background structure of this conception may need some further tinkering, as one may object that a background of only one of these other-than-human forces is insufficient for making something natural or is an insufficient notion for partially grounding something like wilderness. A cluster concept framework could be adopted here to address these concerns where some minimally sufficient number of forces in certain degrees need to be present for something to properly qualify as natural as regards wilderness. Other solutions may also be possible, but a conception of the natural that would either render Mars unnatural or have it fall outside the distinction as Woods's might should be unsatisfying. Therefore, Mars is natural, though with some modifications to Woods's approach that address his account's biotic biases.

Second, wildness. In thinking of the places that humans have access to or will have some access to in the near enough future, Mars is definitively uncivilized, undomesticated, and untamed. A few rovers (and a small helicopter named Ingenuity!) do not make a civilization. The landscapes and systems there are entirely uncontrolled by humanity – there are certainly no trammelings there – and as such, Mars is untamed and wild. To reiterate, wildness according to Woods is an internal capacity, so the question is then whether Mars has the capacity for "authentic, autonomous, and spontaneous expression." Mars has this capability – it can express itself in ways that are authentic (being characterized as *truly* Martian), autonomous (its systems and happenings being untrammeled and thus independent of "human designs and purposes…[characterized by] happenings, movements, and trajectories of the other-than-human world that occur independently

and in spite of human intentionality" (Woods 2017: 253–254)) and spontaneous (its dynamic systems are autonomous "independent of any conscious design or purpose" (255)). Notably, there are no necessary biotic components to wildness for Woods, such that Mars's being lifeless poses no issues here. Therefore, Mars would qualify as wild according to Woods's analysis without modification.

Third, freedom. Freedom is the external expression of the capacities of wildness and the lack of constraints on such expression. In short, without human trammeling that would confine or destroy the wildness of Mars as it is, Mars is free. When it comes to Mars, there is certainly a lack of control or confinement of its actual expression, therefore, Mars is free on Woods's account.

If Mars is wilderness, then we can apply wilderness ethics and a discussion of the values of wilderness to the protection of Mars. As the analysis above maintains, Mars is wilderness on Woods's account with some minor modifications, so we may proceed with a discussion of protection of Mars and wilderness values.[25] This conclusion has ethical and political consequences. One of the primary ways in which wilderness areas and their associated values have been protected is through the legislating of protected areas, whether as national parks, wilderness areas, or heritage sites. This method of protection has already been proposed by Charles Cockell and Gerda Horneck (2004; 2006). But there is an important difference in contexts between setting up parks or designated wilderness areas on Mars versus on Earth. Besides the vast differences in the actual land or environment we find on each planet, humanity finds itself in a unique position regarding Mars and wilderness values. On Mars, we can preserve wilderness values pre-settlement, in contrast to wilderness protection on Earth where instead environmental

[25] For the purposes of exploring extraterrestrial wilderness preservation, I will refer to Mars, however these problems and solutions apply to other similar (and perhaps radically dissimilar) extraterrestrial bodies.

activists are fighting a more defensive battle: the current pre-settlement condition, as opposed to Earth's post-settlement condition allows for some optimistic values maximization while under the (perhaps pessimistic) assumption that there will be some significant human presence on Mars in the future, whether rightly or wrongly. The following two sections will introduce and critique/expand on their proposal in line with protecting Woods's value-adding properties of wilderness: naturalness, wildness, and freedom.

IV. Martian Wilderness and the Prospects of Protection

Charles Cockell and Gerda Horneck have proposed a planetary park system to protect particular geographic regions of Mars (2004; 2006). Cockell and Horneck's park system would emulate something like the national park system or wilderness designated areas in the United States or elsewhere. Their proposed restrictions within these parks echo the good nature etiquette of "leave no trace," as well as those that responsible field scientists ought to follow; in the extraterrestrial wilds, parts of Mars are not to be disturbed – avoiding of spacecraft or robotic incursions, limiting or prohibiting waste, restricting access, and maintaining strict sterilizing procedures for preserving astrobiological subjects of study, etc. are recommended. They provide multiple arguments for establishing these parks, arguing:

(1) that there are *intrinsic value* or *Land Ethical* reasons for extending our moral responsibilities to the land community to Mars in the spirit of a spacefaring Aldo Leopold.[26]

[26] Notably, J. Baird Callicott has argued that Aldo Leopold's land ethic is necessarily earth-bound (Callicott, 1986; Weston 2009: 165).

(2) that we may have good heritage reasons to preserve parts of Mars for *future generations*, possibly seeing these extraterrestrial lands as part of some common heritage of humankind.

(3) that there are places of unique natural *beauty* that ought to be preserved for their natural beauty.

(4) that there may be *utilitarian* scientific value in studying the geology of Mars, and perhaps even biology of Mars, if it exists.

(5) that there are *historical* values to be preserved on Mars, such as landing sites. (2004, 292-293)

They then propose seven different parks along these criteria, broadly mapping out their locales (2004, 293-294; see, specifically, Figure 3.1). The seven parks they propose are Polar Park, Olympus Park, Desert Park, Historical Park, Marineris Park, Southern Park, and Hellas Park. Cockell and Horneck remain open to more parks than the ones they suggest, but at least begin a conversation about a particular planetary protection regime. In working on issues of extraterrestrial environmental conservation and preservation, they also propose a working definition of extraterrestrial wilderness as "an area of a planetary surface (with its communities of life, if they exist) untrammeled by people, where people are visitors who do not remain" (Cockell & Horneck 2006: 257). This definition retains the language of "trammelings" found in The Wilderness Act (1964) that Woods (2017) also uses; however, it also retains the language of persons as visitors who do not remain, which is antithetical to the kind of harmonious participation with wilderness that Woods's account allows for, and thus may also retain problematic conclusions with regards to terrestrial wilderness and the histories of indigenous peoples (Woods 2017: 115–116). Interestingly though, the definition offered by Cockell and Horneck uses "people" instead

of "human," thereby accounting for – whether intentionally or not – non-human persons in the form of possible extra-terrestrial intelligences that have the status of personhood; surely some such beings may also be able to trammel, but places where humans might merely be visitors might be homes for other persons alternatively adapted to those environments.

We are currently in a pre-settlement stage of space exploration: there are no space colonies and no permanent residents living off Earth. The International Space Station (ISS) is the closest thing humanity has to a space colony, but it is far off from what science fiction, or even our current space explorers and financiers, are imagining. Cockell and Horneck's proposal has been critiqued as seeming an "over-reaction" or "superogatory," but I think they are right in thinking that it is not, and that it constitutes a justifiable, precautionary step in space exploration (2006: 257). The implementation of a park system at this pre-settlement stage is imperative *now*. If we want to protect, say, Olympus Mons in part for its value-adding properties of naturalness, wildness, and freedom, or for its scientific value, uniqueness, irreplaceability, etc., we should make sure that it is protected *for those values*; such a protection scheme can aim at maximizing these values and their preservation at a pre-settlement stage, taking a more aggressive approach to protection than so-called "rear-guard" approaches to environmental protection on Earth (Matthews 2020). While there is good reason to protect historic landing sites and the like for their historical importance to the history of humankind's adventure of space exploration, it's also important to limit the number, size, and disparateness of such sites. Olympus Mons is exceptional and should be protected because it is an exceptional location of wilderness and its associated value(s), not because it's a historic landing site. We should, in protecting Martian lands, protect them and recognize them for what they are, rather than transform them into sites of conquest and admire them for the conquest that occurred. Ambitious and idealistic protection goals are a good starting point, though I proceed,

again, with the assumption that there will be some future permanent human presence on Mars; the shape that Martian settlements in physical and political design, as well as their relationship with their home planet or country is another, separate matter. With the assumption that there will be *some* human presence, it is important to protect wilderness on Mars now rather than later, especially as such protections will limit space exploration *now* as well. Of course, once humanity enters a settlement phase of space exploration great care should be taken to minimize the impacts on (and in/under/above) Mars as well. In line with managing precautionary planetary protections for Mars in this pre-settlement stage, the next section will offer a critique and expansion of the proposal from Cockell and Horneck.

V. Designing for Wilderness: Parks, Settlements, Values, and Future Directions

The planetary park system proposed by Cockell and Horneck is a good idea, generally; however, there is a need for expansion of their boundaries, as the plan is currently arbitrarily minimalistic, often only protecting "representative portions" of particular geographic features rather than protecting them in their entirety (2004; 2006). In this section I argue for an expansion of the park boundaries and propose a horizon limiting condition for park boundaries, while also proposing additional parks as well. In line with Cockell and Horneck, the recommendations produced herein are hardly the final say on the matter – there may (and likely should be) more parks than I recommend herein, and if criteria for park boundaries could be recommended that cover *more* of the Martian surface, I may be amenable to those suggestions as well, as I am here concerned primarily with planetary protection in line with wilderness values and other, aesthetic values that may arise thereupon.

Cockell and Horneck propose particular boundaries for their parks. The reasoning for protecting certain areas is clear enough, whether protecting Chasma Boreale as a part of their proposed Polar Park as both a site for astrobiological research and a representative portion of the polar cap or protecting a portion of the Chryse Planitia desert as Historical Park for both its beauty and being a historical site of NASA's Viking 1 and Mars Pathfinder missions (Cockell & Horneck 2004: 294). The reasoning for drawing their boundaries exactly where they do is somewhat curious however, especially given the reasons proffered for their protection. Olympus Park protects only Olympus Mons (Figure 3.1; See also, Figure 3.2, Object 1), but excludes the other fantastical geographic features of the Tharsis Bulge: the Tharsis Montes volcanos sitting to the southeast of Olympus Mons - Ascraeus Mons (Figure 3.2, Object 3), Pavonis Mons (Figure 3.2, Object 4), and Arsia Mons (Figure 3.2, Object 5). Additionally, also a part of the Tharsis Bulge, is the largest Martian volcano in terms of surface area, Alba Mons (Figure 3.2, Object 2). These other volcanos are left unprotected by Cockell and Horneck, and it is unclear why if we are prioritizing wilderness values, scientific research, or ethical values associated with some land ethic or focus on future generations. The reasons they offer imply greater protections than the ones they provide, perhaps extending to most of Mars since all of Mars may be *de facto* wilderness. As history shows, as often happens, wilderness values are weighed against other competing values and negotiation of where to build and what to sacrifice will likely occur, so more protection is needed at this time than less.[27]

[27] It is worth noting here that Cockell remains friendly to private industry on Mars, advocating for the implementation of a Lockean land-use policy for the planet and incentives for private industry to establish itself on the red planet (Cockell 2006; Cockell 2009; Cockell & Horneck 2006). The more "Lockean land," or "open land," the more area there is for development and industry. Discussion of the politics here, conceptions of property, whether there really is a "need" to encourage settlement, colonialism, economics, governance, and the appropriateness of private enterprise in outer space more generally all need to occur as well. It ought not be presumed that the extension of systems as they are now into the future, just with more "advanced" technology, should be the way of the future. Such a projection of the present into the future fits within Murray Bookchin's conception, and subsequent critique of, futurism (Bookchin 2005: 431, footnote). It is thus worth noting that, while not specified in this current paper, I believe that there still

Further examining the proposal by Cockell and Horneck, Valles Marineris (Figure 3.2, Object 6) is the "grand canyon" of Mars, though it is about as long as the North American continent and much deeper than the Grand Canyon. According to NASA, "the grand [Mariner] valley extends over 3,000 kilometers long, spans as much as 600 kilometers across, and delves as much as 8 kilometers deep. By comparison, the Earth's Grand Canyon in Arizona, USA is 800 kilometers long, 30 kilometers across, and 1.8 kilometers deep" (NASA, 2017). Inexplicably, Cockell and Horneck only propose protection for an Eastern portion of Valles Marineris, leaving the majority it unprotected by their park system, notably excluding Noctis Labyrinthus, the Western portion of Valles Marineris in the Tharsis region. In a similar vein, their proposal for protecting Hellas Planitia (Figure 3.2, Object 8), the great basin and impact crater, protects only a northern portion of the basin, excluding the south and the rim of the basin. Furthermore, their Southern Park protects only a small portion near the southern polar ice cap. One thing that global climate change on Earth has highlighted is the importance of the polar ice caps to the maintenance of the global climate. For those purposes, the southern park ought to be extended, covering the entirety of Planum Australe (Figure 3.2, Object 11); the same logic extends also to instituting a Northern Park as well for Planum Boreum (Figure 3.2, Object 12). In protecting the other parks, global Martian climate and atmosphere is important, so protecting these areas from development or resource exploitation is imperative to protecting the other parks and respecting the integrity of the Martian environment overall. In summation, Cockell and Horneck's initial planetary park proposal has its merits, but extending this protection is imperative for the protection of wilderness value, especially as regards aesthetic values and scientific research (in addition to potential moral status).

ought to be stringent restrictions on use of non-park lands and non-appropriation by both governments *and* private corporate entities, but I herein lack the space for the particulars of those arguments.

Mars is currently boundary-less – surely there are physical boundaries as evidenced by cliffs, mountains, craters, dunes, etc., but there are no imaginary political boundaries (the closest we get are, perhaps USGS quadrangles and coordinate systems (Batson 1973)). Since all of Mars on the analysis above counts as wilderness, drawing boundaries for protection is messy business. One option is to argue that all of Mars is wilderness, ought to be protected, and therefore any development at all is off the table morally-speaking. I do not plan on addressing this question in detail either, but instead will begin with the (perhaps) pessimistic assumption that some development will occur – the assumption that there will be some human presence on Mars in the coming centuries, and that this presence may be relatively permanent. Determining boundaries and limits may help in curbing some more invasive exploratory projects as well as put limits on the development that will occur under this assumption. Still, the negotiation of these boundaries poses a problem. Cockell and Horneck's boundaries are relatively arbitrary or unjustified based on the reasons they present in their work (2004; 2006). To draw boundaries in the first place is to force a kind of human perspective onto the red planet and its features. One option is to protect particular areas of geodiversity, but depending on the parameters set, this could lead to a relatively limited protection plan that approaches Cockell and Horneck's reasoning of only protecting "representative" areas – Mars has several shield volcanoes, so why protect more than one (this might be the reasoning behind protecting only Olympus Mons (Figure 3.2, Object 1)). We could, instead, merely protect areas of geological or geographic magnificence. This perspective protects many amazing areas, though, perhaps, all of Mars might qualify – "magnificence" is a sufficiently ambiguous criteria unless certain aspects of a possible phenomenological experience are specified as criteria.

In line with a notion of wilderness is that of the phenomenology of wilderness: wilderness experience. Wilderness as untrammeled areas that are significant locations of the value-adding properties of naturalness, wildness, and freedom also provide opportunities for fantastical aesthetic experiences – whether that of appreciative aesthetic attitudes of natural environments or encounters with the sublime. If one were to visit a designated park or wilderness area on Mars, one's senses would naturally be cut off to some degree due to the equipment necessary for human survival on the Martian surface, like a pressurized, airtight space suit. With this equipment, you could not *feel* or *taste* the Martian air, nor could you *smell* the Martian environment, but you certainly could *see* and *hear* Mars (Uhlir & Bishop 1986: 190). Were we to terraform Mars such that you could visit Olympus Park without the spacesuit, you'd still be in a magnificent environment, but the sensory inputs would be fundamentally artificial or unnatural to some degree; the naturalness of the dangerous yet beautiful Martian landscape has been significantly eroded; thus, terraforming would be antithetical to some of the values the park system would be trying to protect and seems to be disallowed on a park proposal.[28] The experience of Mars will be primarily visual; therefore, protective boundaries for planetary parks on Mars could be drawn with reference to the visual in order to preserve an important aspect of wilderness experience. To this end, I propose the adoption of a horizon restriction: human artifacts should be out of reach from the

[28] One possible rejoinder in favor of terraforming Mars might be to terraform Mars but instead of the human settlement being in glass dome-style s pace colonies, the parks themselves should be cut off and isolated, while being monitored to preserve the enclosed environment underneath. Such a proposal still seeks to *control* Mars, and part of the essential environmental character of Mars or wilderness comes from the *lack of control* we typically have in such places. The cutting off and partitioning of these different environments would represent a serious trammeling and destruction of connection between the relevant Martian environs (We might here think of an important difference between wilderness boundaries being "fenced in" or humanity being "fenced-out."). This would also result in a kind of taming and control that reduces the hostility of the place, but a lack of comfort may be part of the valuable experience one can have in wilderness. Furthermore, it seems a park system might already preclude the option of terraforming. The parks are more than just the land; part of what would make Olympus Park, Olympus Park would also be its sensory inputs. The Martian sky is different than the Earth's, and an Olympus Park with an Earthen sky rather than a Martian one fails to preserve an important aspect of the nature of the park, even if such an atmosphere were more "humanized" than "human-controlled." If we were to terraform Mars, while we would then have more possible sensory inputs, they'd be fundamentally *un-Martian*.

geographic or geologic features of Mars that are protected under the planetary park scheme – all should be beyond the horizon from any point within the park – even if Hellas Planitia (Figure 3.2, Object 8) is protected, we still lose something of significance if settlements and commercial industry are surrounding and crowding it.

Edward Abbey's *Desert Solitaire* provides predictions of the development of national parks and presents itself as a eulogy for the death of solitude in wilderness in Arches National Park, writing in the book's introduction that "most of what I write about in this book is already gone or going under fast. This is not a travel guide but an elegy. A memorial. You're holding a tombstone in your hands" (1971: xii). Such predictions as those in his "Polemic: Industrial Tourism and the National Parks" soon came to pass – increased access via roads and automotive tourism flooded the park, leading to many more people visiting these natural places (48-73). Arches itself saw about twenty-five thousand people per year when Abbey was working as a park ranger there from 1956-1957, but now sees almost a million visitors per year (Gessner 2015: 75). The protection of fantastical geographic areas extended to the horizon protects not only the geographic area but the visual experience of any present person, providing protection for the potential of transformative wilderness experiences as well as the wilderness itself; combined with access restrictions, such experiences may remain possible.

The application to Mars is straightforward, however the size of things is, perhaps, somewhat disorienting, both in that the terrestrial features of Mars are so large as to be unlike anything on Earth, while also combining with Mars's being a smaller planet. Mars, having a much smaller than radius than Earth, would result in the horizon's being perceptually closer than on Earth; such a view may be disorienting to those first arriving on Mars, which Kim Stanley Robinson incorporates into his *Red Mars*, but may become natural to any persons living on Mars

for an extended period (1993).[29] This odd relation to the horizon would inculcate a unique Martian phenomenology. Cockell and Horneck propose Olympus Park for the protection of Olympus Mons (Figure 3.2, Object 1). We might think to measure from the peak of Olympus Mons, 26km above the Martian plains; however, due to its sheer size, its being a shield volcano, and the gradient of its slope, you could not see anything *other than Olympus Mons* from its peak. The edges of Olympus Mons are characterized by massive cliff faces, and so we might instead use the edges of Olympus Mons to generate the boundaries of Olympus Park – standing atop the edges of this awesome volcano, what could a visitor see? Other areas, unlike the Massive Olympus Mons that rises above the regular plains surface of Mars, are instead deep, such as Valles Marineris (Figure 2, Object 6) or Hellas Planitia (Figure 2, Object 8); for these regions, we might instead determine their boundaries from their edges looking outwards, though the relatively lower elevation as compared to the Tharsis Bulge extends the boundaries only slightly.

Using mapping technologies such as Geographic Information Systems (GIS) and detailed topographic mapping, we can actually determine these boundaries; a viewshed analysis in ArcGIS along with Mars digital elevation models (DEM) based on data acquired from satellite study of the red planet, will allow for determining where one may be able to see from any particular location on Mars. Conveniently, the data exists for these analyses in large part due to the Mars Orbital Laser Altimeter (MOLA) on NASA's Mars Global Surveyor (MGS) spacecraft (Astropedia 2020). With an eye towards climate protection, we might be able to also use data regarding ground water ice to avoid the release of too much water vapor into the atmosphere (JPL 2019). Furthermore,

[29] Robinson, writing from the perspective of the engineer, Nadia Cherneshevsky, "Back to the west the horizon was marked by a small flat-topped hill. It might be a crater rim, it was hard to say…the horizon was closer than seemed right, and Nadia paused to take note of that, suspecting that she would soon become accustomed to it, and never notice. But it was not Earthlike, that strangely close horizon, she saw that clearly now. They stood on a smaller planet" (1993: 98).

Cockell and Horneck's Southern Park is supposed to protect older regions of Mars for geologic study, but a more fine-grained analysis can yield non-arbitrary park boundaries (Sphon, Sohl, & Breuer 1998; Tanaka et al. 2014). Different regions may call for different boundary criteria and correspondingly differences in protection policies.

From here, we may also consider post-settlement space colonies. There are arguments against colonizing other planets like Mars, but those will not be dealt with here (for such a position, see Stoner 2017). I will not commit to a position on the matter in this paper, instead, looking at the uniqueness of Mars and the current issues with National Parks that encroach on wilderness value, I will attend to possible protocols or restrictions for settlements on Mars.[30] It is possible that some settlements on Mars, far into the future, may be on the surface, like the science fiction glass domes in popular imagination.[31] The parks should be given distance from human settlements – they should be far from home, far from safety (this is not to preclude something like, say, a ranger's station or a "cabin" or two for emergencies, but such things ought to be either underground or largely imperceptible). We should avoid too many (or any) roads, paved or unpaved, and the

[30] It is worth noting at least one important difference between Mars and Moon regarding the potential park systems. A park system on Mars should be, relatively, *less* restrictive than a park system on Moon, and this is due to atmospheric and weather differences between the two. The weather on Mars can be chaotic and violent, but wind at least allows for the signs of human trespass on the Martian surface to be swept away; tracks can be covered through natural Martian processes. Moon, however, has no such atmospheric events that could serve a similar purpose, and it would certainly be antithetical to preservation to have someone sweeping up the park of footprints after visitors traverse lunar environments.

[31] Whether such structures will be built on the surface or not is questionable. The radiation that the Martian surface endures due to its extremely thin atmosphere and lack of a magnetic field is extremely high. Humans on Mars would be subjected to large amounts of radiation. The extended effects of such radiation on the human body and microbiome are unclear – this also extends to any nonhuman animals or plants that might be brought along to Mars for food or cleaning carbon dioxide out of the air of built environments on Mars. It is possible that (initial) Martian settlements are built under the Martian regolith to reduce radiation impact, much as Kim Stanley Robinson's first hundred Martian settlers built named Underhill in his *Red Mars* (1993). It is possible that life on Mars, *sans* terraforming, is rather life *inside* Mars; one could imagine an entire underground Martian society to avoid dangerous solar radiation. This raises a further ontological question about the boundaries of wilderness – how deep does a wilderness extend (as well as how high?)? Furthermore, we might also say that a life inside of Mars may miss the unique *environmental* character of Mars (though I'm sure its bedrock strata or lava tubes are beautiful, and Martian underground architecture may make use of such beauty in its design as a unique Martian architectural tradition develops). Still, since much of the imagination plays with the idea of living *on* Mars, we can imagine that there might be some sort of technological fix for blocking significant harmful radiation while allowing for viewing the landscape outside the dome settlement.

over-commercialization of these parks like we've seen with some of the National Parks in the United States, something which Edward Abbey rightly critiques and mourns in his *Desert Solitaire* (1971: 48–73). As such, we should ensure that no settlement is built within view of the park. Such distance leaves open the question of how one is to ever get to the parks even, but this may be done through, perhaps, underground rail or an above ground "dune buggy" that allows one to experience and explore the magnificent Martian landscape on the way to and from the park as well. Hiking and camping on the way to the parks will likely be impossible without significant technological breakthroughs and a substantial warning system for Martian dust storms.

The horizon restriction may also thereby entail height restrictions if building near the horizon boundaries. There are legitimate questions concerning the future of space commercialization and space tourism. Might future peoples from Earth be able to pay a private space-faring company to take a vacation to Mars or the Moon? It's possible that such a system develops, though perhaps one should not, especially if we are to preserve Mars, as preserving it means keeping it relatively inaccessible. What access is granted ought to be restricted, yes, but equitable; whether through a lottery, rotation system, or limit on visitors per day, there should be some ability to visit these places, but care must be taken to avoid their becoming another Mt. Everest (see, for example, BBC 2019; Neighbour 2020).

The promise of new worlds, new environments, and new cultures brings with it the enhanced possibility of new forms of art and aesthetics, whether in the true generation of the novel or in the insightful reinvention of the past; perhaps, for example, with a primary visual experience of the environment there may be a revival of landscape art or reintegration of the Claude glass[32] into landscape interaction – storytelling and imaginative modes of art and expression may also

[32] For a fantastic history and analysis of the Claude glass, see Maillet 2004.

take prominence as well. Mars is replete with natural wonders and may be home to unique forms of natural beauty, providing significant aesthetic reasons for its protection (McMahon 2016). The value-adding properties of naturalness, wildness, and freedom contribute to and synthesize into aesthetically appreciable aspects of the Martian environment. Mars is a wonderous place filled with geodiversity (or, perhaps, areodiversity?) with incredible plains, canyon lands, volcanoes, sand dunes, polar ice regions, impact craters, and much more. Environments play a significant role in shaping peoples and cultures, and living in a Martian environment will result in humans living on Mars to develop their own cultural modes. Additionally, how such cultures develop may depend in part on interplanetary relations and politics, as well as the radical "inside-life" that living on an un-terraformed Mars would necessitate, meaning that the intentional development and design of the settlements, physically and politically, will be extremely important. As a Martian culture develops, a relationship to Martian land and regolith will also develop. Different places will take on meaning and boundaries for parks will need to be renegotiated as time goes on, with special respect for the Martian communities that grow on Mars, as well as for Mars itself.

VI. Conclusion

Which areas are designated as wildernesses and which are not will involve serious values discussions. One way to address this is by attending to some of the values that Cockell and Horneck address wanting to protect with their planetary park system. The primary purpose of the one-eighths proposal of Elvis and Milligan is to set the boundaries on resource extraction before it's too late, and in that same spirit, setting up a planetary park system ahead of time is imperative to the precautionary project of those wanting to protect the extraterrestrial wilds. Mars is wilderness in that it is untrammeled and a significant location of the value-adding properties of

naturalness, wildness, and freedom. In further exploring Mars, as well as considering the possibilities of settling Mars, it is important in doing so to protect these wilderness values and the valuable aesthetic experiences they may engender. To this protective end, there should be a wilderness designation used for certain areas of Mars, limiting the amount and kinds of access to them. The proposal put forth by Cockell and Horneck (2004; 2006) is a good start, but the proposal offered in this paper expands on their previous work, while proposing a horizon criterion for drawing park boundaries to protect wilderness experience. Details concerning the particulars of area management still need further imagining, and there are likely other parks or protected areas needed. For example, as further studies of Mars reveal locations of significant ground water in the form of a kind of permafrost, we ought to begin designating these areas as protected wilderness as well out of concern for the Martian climate. With exploration of Mars an issue of public interest, developing planetary protection protocols for governments and private industry to abide by will be essential, and a wilderness area/park system is one, at least familiar, means by which we may do so.

Figures:

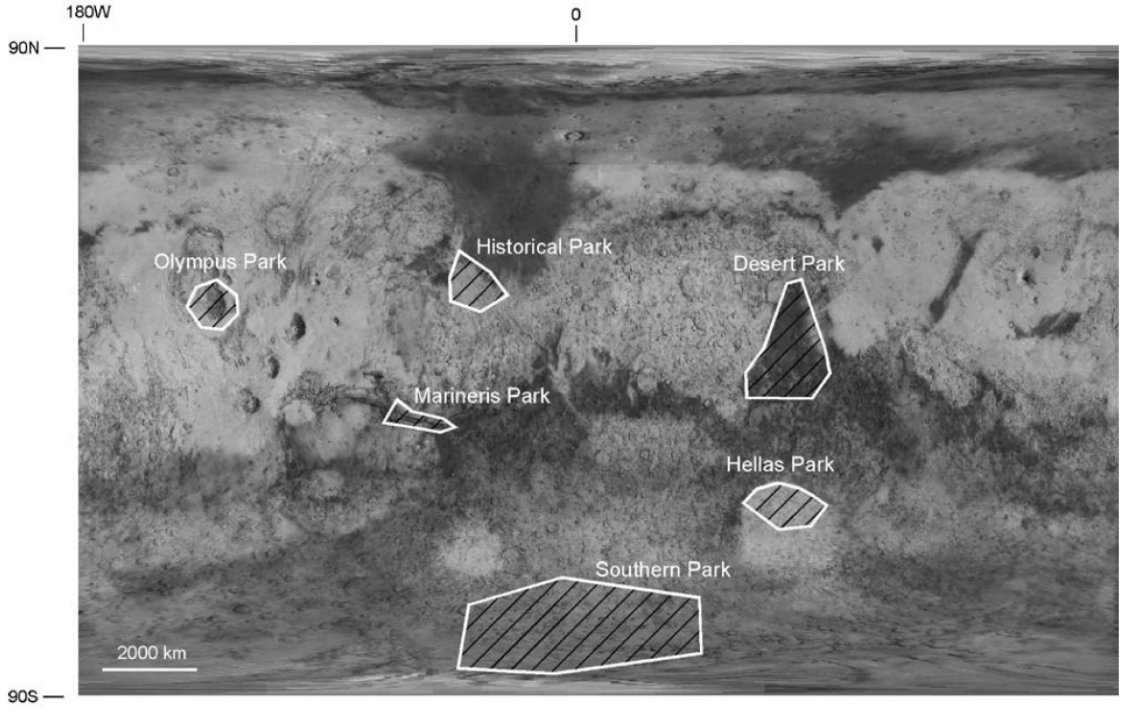

Figure 3.1

Six of the proposed seven planetary parks for Mars introduced by Cockell & Horneck (2004). Perhaps due to representative augmentations incurred in mapping a sphere onto a rectangle, they do not include their proposed Polar Park on this map.

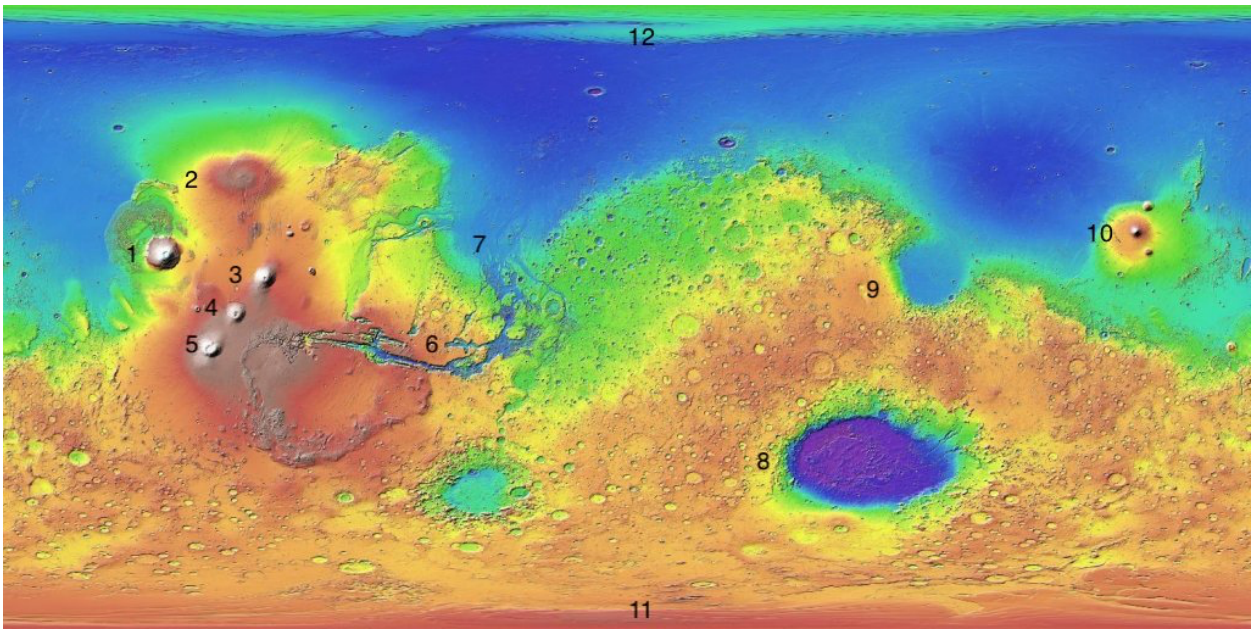

Figure 3.2

A Mars MOLA (Mars Orbiter Laser Altimeter) Global Color Shaded Relief with numbered annotations referring to specific geographic or park-relevant features of Mars referenced in this paper (Astropedia 2020). Map data for the image is adapted from Smith et al. 2001.

Key:

1 = Olympus Mons 2 = Alba Mons 3 = Ascraeus Mons 4 = Pavonis Mons

5 = Arsia Mons 6 = Valles Marineris 7 = Chryse Planitia 8 = Hellas Planitia

9 = Syrtis Major 10 = Elysium Mons 11 = Planum Australe 12 = Planum Boreum

CHAPTER 4

ECO-POLITICS AT THE FINAL FRONTIER: VISIONS BOTH FUTURIST AND UTOPIAN[33]

[33] Lindquist, M.A. To be submitted to *Environmental Philosophy*.

ABSTRACT:

Science fiction has long imagined humanity living on other planets, and such fictions have come to serve as aspirational goals. Considering a drive to colonize the solar system, establishing permanent settlements on Mars, this paper interrogates this drive towards expansion. Working from Murray Bookchin's conceptions of futurism and utopianism, I examine contemporary instantiations of these two streams of thought. Current futuristic proposals for space colonization extend notions of property, politics, economics, social organization, etc. in ways that would serve to further empower, entrench, and exacerbate problematic systems of hierarchy and domination. I argue that, instead, we ought to embrace utopian solarpunk imaginings, though it is unclear whether such future peoples would want to settle other planets. Before settling other worlds, humanity must first address issues on Earth to ensure that we do not export these ills to new worlds.

I. Introduction

Humanity's ascension out of our own atmosphere and towards other planets continues to progress, and philosophical investigations must accompany further exploration of the solar system and beyond. As popular culture and tech giants discuss building settlements on extraterrestrial lands, discussion must not simply discuss how it would be logistically possible, but whether it should be done at all. Humanity expanding its reach to live amongst the stars on worlds other than Earth has been a frequent theme in science fiction. Current proposals for colonization, come from private entities rather than governments, at least for the time being (Morton 2018; Anderson 2019; Brown 2022).

Consider the vast potentiality of what a space colony might look like. One could attempt to terraform[34] another celestial body, such as Mars, Moon, or one of the many moons of Jupiter. Mass-scale terraforming of certain planetary bodies proves difficult however, as, for example, the Moon or Mars might simply be unable to gravitationally hold onto enough of an atmosphere, such that it could harbor Earth-based life. Some celestial bodies may not contain enough in the way of naturally occurring CO_2 or other greenhouse gasses for more "straightforward" terraforming through the release of compounds already found on these rocky bodies (Milligan 2015; Jakosky & Edwards 2018); further issues arise with bodies without spinning liquid cores, as these planets thereby lack the magnetosphere necessary for protecting an atmosphere (and inhabitants) from harmful cosmic radiation that would strip away said atmosphere (Jakosky & Edwards 2018; Pavid 2018). In the possible case of human colonization of celestial bodies in our solar system and beyond, domed cities offer a viable alternative to terraforming. The dome structure itself has semiotically arisen in literature – primarily science fiction – as a marker for the glistening city on

[34] Terraforming is defined as "a process of planetary engineering by which the extant environment of a planetary body is transformed into an environment capable of supporting human inhabitants" (Schwartz 2013: 1).

the hill, a utopian bubble that merges the garden and the machine into a sustaining community. These domed cities could be massive constructions to house not just urban environments, but also allow for the creation of tillable land for crop growth or semi-wild nature to exist (though perhaps this manner of farming imagines a more wasteful means of food production in the future versus, say, some other future form of growing crops using so-called liberatory technologies (Bookchin 2004, 2005)).

The construction of domed cities would engage with "para-terraforming" – a smaller-scale, directed form of terraforming.[35] If one accepts that planet-wide terraforming is morally impermissible, this can leave the proverbial door open for at least *some* settlements and the moral permissibility of para-terraforming, depending of course on the reasons one accepts. If, for example, one accepts arguments for an entirely hands-off approach to celestial bodies such that humanity ought not even land rovers on Mars, then even a small-scale dome settlement would be out of the question (See, for example, Lee 1994). Alternatively, small settlements dispersed across the planet could leave most of Mars in its natural, wild, and free state. In this paper, I will assume that planet-wide terraforming is morally impermissible, but some small-scale settlements are morally permissible. An alternative framing might be to assume that anti-settlement sentiments will lose out and that there *will* be some permanent, minimal presence of humanity throughout the solar system. From here arises the questions, *how should these societies function* and *if we are to settle the solar system, what should the preconditions for such settlement be?*

A multitude of political questions emerge regarding space exploration and the future of humans beyond planet Earth. Settling Mars is still temporally distant since, technologically speaking, we aren't there yet even if it does remain possible (Milligan 2015). With long temporal

[35] Sometimes this is also known as a "worldhouse" model of terraforming and imagines greenhouse-like habitats on other worlds (Taylor 1992; Williams 2019)

distance, it is also possible that the political systems that philosophers have extended to outer space may not sustain themselves to reach that point in time; if our current capitalist modes of production and systems of hierarchy and oppression are likely to wreak havoc and destruction on our own planet to the extent that it actually inhibits our ability to become a multi-planetary peoples, then the extension of such modes of production to outer space are already implausible presuppositions (Kennedy 2016). Issues of real scarcity, as well as distance from the resources of Earth, may call for different political organization than that of current spacefaring countries on Earth.

The intersection of science fiction and the utopian tradition calls for a radical reimagining of the structure of human political society beyond Earth's atmosphere. As Murray Bookchin states in "The Meaning of Confederalism," "[th]e assumption that what currently exists must necessarily exist is the acid that corrodes all visionary thinking" (1989). To solve society's problems, we need to think critically, creatively, and compassionately (important skills for thinking as identified by Robert Fisher (2013), especially regarding the maintenance of democratic ideals). The opportunity to develop a human colony on Mars calls for thinking radically in these ways. In short, this paper seeks to examine the base presuppositions being made in recent work on human political and economic relations in outer space, while also reimagining how a space society could – and should – function, primarily through the utopian tradition as explicated by Murray Bookchin (2005).

Section II will provide a conceptual structure for framing further analysis, expanding on Murray Bookchin's distinction between utopianism and futurism (Bookchin 2005: 431, footnote). Section II will also consider the views of science fiction author Kim Stanley Robinson on utopianism. Section III, framed as a discussion of futurist positions, will explore the question of how space explorers and agencies ought to conceive of or treat extraterrestrial lands. The concern here is with humanity's relationship to the land of these other worlds. What might these societies

look like, and, furthermore, what should they look like? The proposals for park systems (Cockell & Horneck 2004; 2006) and proposed limits on resource extraction within the solar system (Elvis & Milligan 2019) serve as examples of ways we ought to conceive of or treat extraterrestrial lands. Cockell (2006), however, maintains that while certain lands are to be maintained as wilderness areas and prioritize scientific research,[36] other lands not preserved should instead be treated as Lockean land; he argues that we ought to conceive of such areas as falling under a Lockean land conception and allowing their appropriation as such (Cockell 2006). I will argue that an approach that conceives of extraterrestrial lands as Lockean in nature fails to provide sufficient grounds for sustainable or morally permissible colonization of extraterrestrial lands. Section IV will then consider the nature of outer space settlements themselves and their political organization within a utopian framework, primarily through an analysis and extension of the artistic/aesthetic and utopian political movement known as "solarpunk." I will then proceed to place the burgeoning solarpunk movement in conversation with Murray Bookchin's dialectical naturalism (Bookchin 2005). I will argue that humanity must approach a utopian vision or create a utopian (solarpunk) society which evades the reproduction of existing systems of hierarchy, oppression, and servitude to the interests of capital. Otherwise, colonization without a radical political shift will likely serve to further entrench and empower current systems of inequity and domination. Section V will be the conclusion, summarizing the paper and offering future paths for research.

[36] Of special importance for Cockell is Astrobiology and the search for life (Cockell 2004, 2016; Cockell & Horneck 2004, 2006).

II. Backgrounding and Foregrounding: Contemporary Futurism & Utopianism

Considering visions of the future, Murray Bookchin draws a distinction between futurism and utopianism in *The Ecology of Freedom: The Emergence and Dissolution of Hierarchy*:

> However widely at odds utopias were in their values, institutional conceptions, and visions (whether ascetic or hedonistic, authoritarian or libertarian, privatistic or communistic, utilitarian or ethical), they at least had come to mean a revolutionary change in the status quo and a radical critique of its abuses. Futurism, at its core, holds no such promise at all…futurism is essentially an extrapolation of the present into the century ahead, or 'prophecy' denatured to mere projection. It does not challenge existing social relationships and institutions, but seeks to adapt them to seemingly new technological imperatives and possibilities–thereby redeeming rather than critiquing them. The present does not disappear; it persists and acquires eternality at the expense of the future. Futurism, in effect, does not enlarge the future but annihilates it by absorbing it into the present. What makes this trend so insidious is that it also annihilates the imagination itself by constraining it to the present, thereby reducing our vision–even our prophetic abilities–to mere extrapolation (Bookchin 2005: 431, footnote)

Originally published in 1985, the distinction drawn by Bookchin situates current visions of the future, especially popular ones perpetuated by the current class of "space billionaires," like Elon Musk with SpaceX or Jeff Bezos with Blue Origin.[37]

An important addition to the notion of futurism explicated by Bookchin (2005, 2019) is that of capitalist realism. Mark Fisher refers to capitalist realism as "a pervasive *atmosphere*,

[37] Bookchin details this distinction at the 1978 Toward Tomorrow Fair as well (Bookchin 2019).

conditioning not only the production of culture but also the regulation of work and education, and acting as a kind of invisible barrier constraining thought and action" (2009: 16). Capitalist realism presents capitalism and its expressions as inescapable, inevitable necessities without any formidable alternative – capitalism persists in part because it denies other possible futures. Complementary to capitalist realism is the mindset that absolutely no other socioeconomic system can successfully function, therefore "being realistic" requires the individual to adapt to capitalism rather than institute any systemic change. Capitalist realism, in effect, limits the realm of the possible by presenting capitalism and its modes as somewhat fundamental to the world, whether by naturalizing it based on human nature or reading it as history into the past, despite facts of history (Fisher 2009).[38] To reiterate Bookchin, "[th]e assumption that what currently exists must necessarily exist is the acid that corrodes all visionary thinking," (1989) and this is precisely what capitalist realism does by limiting the realm of the possible and the imagination.

Kim Stanley Robinson embraces utopianism over futurism in the *Mars* trilogy (1993; 1995; 1997), in which he examines the potential social and political tensions of a speculative terraforming endeavor on Mars. Robinson also laments the conservative and stifling nature of capitalist realism (Robinson 2022: 94–100). Robinson, commenting on the use of "utopian" as a means of dismissing an idea, cites capitalist realism:

> 'Slinging' the term utopian…using it as a put-down, I presume—implying that it's a synonym for "unrealistic," or "too perfect to ever happen"—that's always a political attack on trying to make a better world. The accusation is itself anti-utopian, taking the form of a

[38] Think, here, of definitions of capitalism that are wide enough to encompass bartering or almost any instance of trade or contract.

faked realistic attitude, now usefully named "capitalist realism." It's like buying into Thatcher's notorious slogan, "there is no alternative" (Robinson 2022: 94–95).[39]

Robinson himself speaks of the need for embracing the hopeful optimism and imaginative power of utopianism. Technological advancements alone cannot produce this "better world," rather a better world may consist of radically different technologies alongside different social structures, institutions, and relationships with the land itself (Bookchin 2004, 2005).

Using the Greimas semiotic square in his analysis of the concept of utopianism, Robinson explicates the relationship between four ideas (1) utopia, (2) dystopia, (3) anti-utopia, and (4) anti-anti-utopia, explaining utopia as "the idea that the political order could be run better" and dystopia as utopia's contrary, "being the idea that the political order could get worse." Introducing the "anti categories," he explains that "anti-utopias are the *anti*, saying that the idea of utopia itself is wrong and bad, and that any attempt to try to make things better is sure to wind up making things worse," thus anti-utopianism implies to dystopianism. Anti-anti-utopia is the contrary of anti-utopia, maintaining that the idea of utopia is actually a good thing, thus implying utopianism; Robinson claims that a "way of being anti-anti-utopian is to be utopian" (Robinson 2018). Synthesizing Robinson's Greimas analysis with capitalist realism, we find capitalist realism to be itself anti-utopian: things could always be worse than they are now (dystopian), capitalism is the best we've got, it's all we can do, etc.

Robinson sometimes speaks of utopianism in an even more general way of simply working towards a better future, a notion that is fairly all-encompassing, which Robinson himself recognizes, claiming that:

[39] Of course, dismissing the work of a utopian such as, for example, Murray Bookchin, for *being* utopian is an empty dismissal, as when a positive case is made *for* utopianism, that case is what calls for response.

> [s]cience fiction that describes civilizations better than the current one is utopian…any fiction describing efforts to make a better world are utopian…a lot of fiction is inherently utopian, because stories about people trying to make a better world are quite common. Fiction typically says that what we do matters; that itself is a utopian position. (Robinson 2022: 94).

It is fair to say that all these have the spark of utopianism in them to be nurtured, but one potential risk of the wider notion of utopianism offered here versus the narrower one offered above is that the narrower definition is necessarily *politically oriented*. But Robinson's narrower offering of utopia is still too general. While utopianism is indeed directed at a better political society, it isn't one that is merely "better," but rather often conceived of oriented instead towards one that is thought to be "the best."[40] Oriented towards the political, utopianism can challenge current structures and systems, and in doing so retain its world-changing or world-generating power; a mere personalized making the world better by simply focusing on the happiness of those around you fails at instituting change at the larger level. This orientation towards changing political and social systems through creative imagining is how utopianism can be made distinct from the futurism Bookchin describes. Futurism, arguably, *does* imagine the world better, but solely through technological improvements, not political reform.[41] In an anti-utopian analysis, futurism merely extends existing political organization as technology advances. Cyberpunk, a futuristic genre that usually maintains current authoritarian structures and capitalism but combines it with added technology, usually including cybernetic enhancements, is often dystopian (Konstantinou

[40] Visions of "the best" may be variable; to reiterate Bookchin, "whether ascetic or hedonistic, authoritarian or libertarian, privatistic or communistic, utilitarian or ethical" (Bookchin 2005: 431, footnote). The question then becomes one of what kind of utopia we ought to aim at achieving. Aiming at a libertarian utopia, the model is nothing to be imposed, but rather something that could be shown to be choice-worthy through prefigurative praxis.

[41] One may rightly think here that a kind of backwards-looking futurism is expressed in dismissals of the plight of the poor in contemporary America. These dismissals focus on technology, claiming that the current poor live better lives than the rich of the past because they have access to refrigeration, microwaves, the internet, etc.

2019). The solution, then, as Robinson indicates, is anti-anti-utopianism, and the embracing of a hopeful optimism, and making that optimism manifest in our imaginative fictions; "Could things be better? Yes. Might imagining things being better help us to figure out how to get there? Yes" (Robinson 2022: 94).

Utopianism and futurism as conceived by Bookchin (2005; 2019) have an analogous relationship to that of science and pseudoscience. One aspect of some accounts of pseudoscience is that "[p]seudoscience is not science, though it masquerades as science" (Monton 2014: 469). Futurism as conceived above, while not challenging the political order, still presents itself as a kind of great hope for the betterment of society and the future through the mere forward march of technological advancement. Images of the future conjured by the likes of Elon Musk generate high tech worlds while leaving political and economic structures intact and extended, if not amplified (see, for example, Persson 2015). Musk's visions (see, for example, Morton 2018; Anderson 2019; Brown 2022) are indeed of a "better tomorrow," but the kind of tomorrow envisioned extends systems, structures, and institutions that are already highly problematic for human freedom and ecological sustainability (as well as social and economic sustainability). A sort of Muskian vision thereby improves the world in a superficial sense, as technology that is not liberatory, nor contextualized in human needs *and* flourishing, does not make the world better in meaningful ways for people: microwaves, electric cars, solar panels, and refrigeration can exist under totalitarian dictatorships just as well as under liberal democracy, or other alternative means of organizing labor and society.

The analysis below proceeds by first analyzing a proposed Lockean land-use policy for Martian land from Charles Cockell (2006), framing such a proposal in the vein of futurism while explicating issues with such a policy. I will examine the potential for utopianism in settling Mars,

explicating utopian preconditions for such settlement for the realization of a utopian project in Section IV.

III. Futurism, Land, & Property

What will the future look like in outer space? Proposals such as the park system (Cockell & Horneck 2004; 2006) and resource extraction limits proposal (Elvis & Milligan 2019), as well as discussions of near-earth research use (Schwartz 2015; 2017) and space tourism (Launius & Jenkins 2006; Marsh 2006) rely on particular political assumptions. Specifically, such discussions extend current western political paradigms of liberalism, capitalism, and representative republican democracy into managing economic and political interactions beyond Earth's atmosphere, both within space colonies and in interplanetary politics. While space treaties and guidelines already exist as set by bodies of the United Nations, such as the "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies" (1966), they are subject to potential changes as politics on Earth changes, especially as many UN treaties and resolutions lack a sufficient enforcement potential – what steps or actions would actually be taken to prevent, say, Elon Musk or the United States from establishing Martian colonies and claiming Martian lands?

The language of the project of extending humanity's reach out into the solar system and beyond is fraught with historical baggage. The language of "the final frontier," talk of building space "settlements" and "colonies" on some other "new world" recalls the deep history of historical injustices, genocides, domination, hierarchy, and oppression enacted in the Americas and elsewhere on Earth. Frontiers have typically been, when wild, destroyed, paved, emptied, and domesticated. Colonialism, imperialism, and the establishment of settlements has displaced

peoples from their lands and homes, been part and parcel to genocide, slavery, and all manner of atrocities to indigenous peoples, on top of also playing a significant role in the slave trade and the institution of chattel slavery. The conception of the "new world" conceived of as a proto *terra nullius* upon which imperial and market interests may play in the apparent abundance serves to mythologize and glorify this appropriation as improvement.

Colonialism in the Americas also included exploitative structures of hierarchy and power between the colonizers and the foreign powers that made political claim to territory across the Atlantic. These structures denied representation to the colonists and propped up exploitative, coercive market relations between the two peoples (i.e., the American colonists and England). Much as it may be argued that slavery was never abolished, but merely changed its manner of expression, colonialism has also changed its form in contemporary global society, enforced through giant multinational corporations (and if we're not careful, multiplanetary corporations). Such systems have now adopted an apparent insidiousness in place of explicit cruelty (for a summary of colonialism, see Kohn & Reddy 2022). Such systems and institutions are not ones of freedom, but rather oppression and degradation of the human spirit, prioritizing financial bottom lines and shareholder value over human well-being, and ought to be fought against both on Earth and off.

The discourse surrounding populating Mars frequently manifests in language of settlement and colonization, thus base concerns surrounding colonialism must be addressed. Consideration of colonization extended to "dead" worlds like Moon or Mars reveals significant differences in context compared with its historical instantiations. Concerns with colonizing unlived planets may be different and primarily rooted in virtue ethics (Reiman 2009; Tachibana 2020).[42] Some of the

[42] See also, Sommariva 2014 and Slobodian 2015 for commentary on motivations for space colonization relevant to a virtue ethics approach to the matter. See, Sparrow 1999 for a virtue ethics account aimed at critiquing terraforming.

morally problematic aspects of colonization as it has occurred on Earth involves the grave harms done to other peoples and societies, whether directly through slavery and genocide, or indirectly through language, culture, or contemporary global market systems. The moral and political critiques of colonialism would also likely apply to our potential interactions with other extraterrestrial life in the universe; however, when concerning celestial bodies that are unlived – those devoid of life – where there are no peoples, societies, or cultures to be colonized, we may ask what harms are left to be done in creating space settlements, especially harms rightly construed as colonialism. Besides possible moral harms regarding these alien lands, another critique could be of a virtue ethic variety. One could argue that, although the external harms of colonization are not present, colonizing space continues a project that has been historically vicious. The concerns here diverge from some of the primary concerns regarding colonialism on Earth due to seemingly significant differences between these cases – colonialism has been vicious because of its impacts on life and peoples, which do not exist on Mars. While it may be possible that such a critique extends effectively to settling lifeless worlds (perhaps some problem with colonizing land qua land), other possible moral and political harms regarding space colonization will be more manifest in interplanetary relations, so it is here that I will focus.

In approaching possible land-use policies for Mars, Charles Cockell proposes a binary conception of land, distinguishing between Planetary Parks and Lockean Land (Cockell 2006), having also argued for the institution of a planetary park system for Mars (Cockell & Horneck 2004; 2006). Cockell situates his proposal of Lockean Land as a means of actively encouraging settlement, claiming that "to successfully settle these worlds will require that the restrictions against settlement are minimised, and the incentives to go there are maximised" (2006: 302), noting further that "[t]o encourage the human exploration and settlement of space, sufficient

incentive must be given for people to explore and settle…Land not meriting special protection should be open to use by any organisation or individual that can find a use for it" (307). Cockell's proposal also serves as a weakening of the protections of the Outer Space Treaty and the Moon Treaty, eliminating "unpopular provisions" by allowing for land claims and development by Earth-based states (Cockell 2006: 308). Cockell's proposal presumes that, one, exploration and settlement of Mars ought to be encouraged and, two, that such encouragement ought to be implemented via market forces. Locke's contention that empty, unused land is practically worthless, as it is labor that produces value, is in tension with Cockell's park proposal (Locke 1988: 296). On Locke's conception of land and value, it is not clear that the distinction Cockell draws between land slated for planetary parks is worth anything, nor worthy of protection whatsoever – in fact, it is more useless in terms of biotic natural resources than even the forests of the Americas which he so disvalued. Despite this tension, assessing the Lockean conception of property and land, especially considering its historical influence on contemporary manifestations of these ideas in liberal democracies on Earth, is necessary.

In Locke's *Second Treatise on Government,* he provides a foundational theory of property, one that has been widely influential (Locke 1988: for his theory on property, see especially, 285–302). Locke conceives of property as something that one acquires by mixing one's labor with some "thing," at least in a state of nature before political society may alter property relations through the invention of money, enforceable contract, or tacit consent (Locke 1988: 299–302, 318–353).[43] In answering the question of how one comes to own something within the original state of nature without stealing from the collective, since in a state of nature all belongs to all, Locke argues that due to the relative abundance of resources within a state of nature, nobody else is worse off

[43] Waldron (2020) also summarizes an accounting of Locke's theory of property as a first-occupancy style of property that places special normative emphasis on labor.

for my, say, picking an apple, and through my labor making it my own; none have been unjustly deprived and so no wrong has been committed (Locke 1988: 288–291).

Locke contends that "the end of government is the good of Mankind." Locke understands this end, in large part, in terms of the enjoyment of property – property being the primary reason for the establishment of a society under government. Locke states that "[t]he great and *chief end* therefore, of Mens uniting into Commonwealths, and putting themselves under Government, *is the Preservation of their Property*" (Locke 1988: 350–351, emphasis in original; Laslett 1988: 192). The status of property in a state of nature is unstable and uncertain, but the institution of government is supposed to enact structures that protect private property to ensure its uninhibited enjoyment by the owner. Property is thus the primary reason for which humans enter into a state of society together (Ibid.).

The shift in the way property operates in a state of nature versus a civil society within Locke's *Second Treatise* leads to conflicting interpretations of his work, namely, the communitarian, common property of the state of nature shifts to the private, government-backed, legislative institution that occurs in a political society. Different interpretations of Locke remain, some casting his theory as a form of "crypto-capitalism" and others in more socialist terms; however, as Peter Laslett argues, "it is gratuitous to turn Locke's doctrine of property into the classic doctrine of the 'spirit of capitalism', whatever that may be. It can only be done by explaining away all the statements which he makes about the origin and limitations of property as obstacles to his true meaning" (1988: 106). Even if Locke's theory of property is not the "spirit of capitalism," the notion of private property may remain problematic. The systemic implementation of private property finds its roots in Locke, and arguably led to much in the manner

of inequality, social ills, and what Engels recalls the working people of England called "social murder"[44] (Engels 2005: 25; Proudhon 2008; Kropotkin 2015).

To make this contrast clear, compare situations regarding food, a material condition necessary for human life. For Locke, in a state of nature, if someone takes more than they can use or lets their crop rot rather than allow it to be taken by the hungry, they have done wrong. Locke writes:

> But if they perished, in his Possession, without their due use; if the Fruits rotted, or the Venison putrified, before he could spend it, he offended against the common Law of Nature, and was liable to be punished; he invaded his Neighbour's share, for he had *no Right, farther than his Use* called for any of them... (Locke 1988: 295)

One who deprives another through waste has stolen from those without or "invaded his Neighbor's share" (Ibid.). The hungry, when excess is available are illegitimately deprived; as such, if the hungry take food from one who has so such more than they could use that it would otherwise rot, they do not steal from him (1988: 290). Under our contemporary systems, or Lockean political/civil society in which we may overrule the morality of the state of nature, we instead have a legal and economic system that leads to massive food waste, rather than providing for those in need (Green 2016; Locke 1988).

[44] Engels defines social murder as:

> [W]hen society places hundreds of proletarians in such a position that they inevitably meet a too early and an unnatural death, one which is quite as much a death by violence as that by the sword or bullet; when it deprives thousands of the necessaries of life, places them under conditions in which they *cannot* live—forces them, through the strong arm of the law, to remain in such conditions until that death ensues which is the inevitable consequence—knows that these thousands of victims must perish, and yet permits these conditions to remain, its deed is murder just as surely as the deed of the single individual; disguised, malicious murder… the death of the victim seems a natural one, since the offence is more one of omission than of commission. But murder it remains. (Engels 2005: 95-96)

The systemization of private property in a manner that has led to the wealth of the few has occurred at the expense of the many, leading to deprivation in terms of insufficient wages, alienation from one's labor, material destitution, etc. (Magón 1911, 1916; Bookchin 2005; Engels 2005; Proudhon 2008; Kropotkin 2015). Global capitalism presents no *real* alternative for most people - the masses cannot opt out. The ability to "just move into the woods and go off grid," besides often being associated with hypermasculine apocalyptic prepper-ism that is often also very strongly rooted in notions of private property, would also require the capital to purchase land, maintain land or structures in association with state or local building codes, and so on. Opting out *en masse* instead may take the form of revolutionary, fundamental changes society to society.

The lack of land for individuals to be able to sustain themselves and their families outside of systems of oppression and exploitation by the capitalist/ownership class or bourgeoisie serves as an important point of contention offered by Pierre-Joseph Proudhon (2008) and Mexican anarchist, Ricardo Flores Magón (1911, 1916), with Magón arguing instead that property's origins are born from nothing other than power, domination, and violence:

> The right of property is ancient, as ancient as man's stupidity and blindness; but just the antiquity of a right can not give it the "right" to survive. If it is an absurd right, it is necessary to abolish it…The right of property is an absurd right because it had its origins in crime, fraud, and abuse of power. (Magón 1911)

The extension of Lockean land to Mars would thus entail the claiming of such lands by those with the means to reach Mars. Proudhon and Magón both hold that, first, all human beings are entitled to some sense of dignity and this dignity takes is rooted in being able to provide for oneself and their community. Furthermore, the satisfaction of this dignity requires that all are entitled to the material means by which they may be able to sustain themselves; in other words, all are minimally

entitled to land enough to feed themselves and live.[45] The ways in which larger societies may develop and organize requires additional explication, but the guarantee of land for sustaining oneself and one's loved ones or community ensures that one may live a life that is absent particular forms of unfreedom that arise from material destitution. The material security of land is complicated in our current geopolitical context, as Earth's geography has already been divided and occupied, apart from Antarctica, though that land is not able to provide the necessary material security and ought to be protected as wilderness (Tin 2017).[46] The thought of Proudhon and Magón can be interpreted as embracing Locke's pseudo-proto communalism to be good, and a belief in a communal society being manageable without a state. This thought approaches that of Rousseau in terms of how human nature is conceived as naturally predisposed to cooperation, an idea also echoed by Kropotkin (Attfield 2021: 70–71; Kropotkin 1902); Proudhon was, in fact, influenced by the thinking of Rousseau (Kelley & Smith 2008: xvii). Proudhon and Magón (along with Bookchin (2005)) provide a radical alternative to the state of political society offered by Locke – a so-called political society can develop grounded in communalism, ecology, and anarchism.

[45] Proudhon brutely summarizes the conclusion of his views as such:

> Man needs to labour in order to live; consequently, he needs tools and materials to work upon. His need to produce constitutes his right, and this right is guaranteed him by his fellows, with whom he makes a similar agreement. If one hundred thousand men settle in a large country like France with no inhabitants, then each man has a right to 1/100,000 of the land. If the number of possessors increases, each one's portion diminishes through this increase, so that, if the number of inhabitants rises to thirty-four millions, each one will have a right only to 1/34,000,000. (Proudhon 2008: 54)

A fuller accounting of Proudhon's view draws out the reasoning, but this portion in particular expresses in clear terms the brute equality of means that one is entitled to on his view and serves to elucidate his (in)famous claim that property is theft (13). Proudhon also lacks a focus on environmental protection, and so the account is rendered problematic as such, but his critique of the institution of private property and its origins is noteworthy regardless.

[46] There are, of course, issues that arise when something like land runs out – what is one to do after all practicable land is owned? This is something addressed by Pierre-Joseph Proudhon in arguing that land ought to be distributed equally. Proudhon writes, "if the first occupants have occupied everything, what is there for the latecomers to occupy? What becomes of their liberties, having an instrument with which to work but no material to work upon? Should they devour each other? A terrible extremity, unforeseen by philosophical prudence because great geniuses neglect little things" (Proudhon 1988: 53). Indeed, as Haqq-Misra points out, Locke himself thought this would not be an issue (2015b: 44).

Locke's conception of property and its dissidents are important for considering space settlements in large part because Mars is *an entire planet of land*, and which political values we go with will affect that land and human relations with one another. Mars, though much smaller than Earth, has about the same landmass, in part due to its current lack of oceans, seas, bays, gulfs, lakes, rivers, and streams (Collins 2008: 203). The future occupation and settlement of Martian land requires thorough planning and consideration, not just environmentally, but in terms of property regimes and settlement regulations (Cockell 2006; Haqq-Misra 2015; Dapremont 2021). Wilderness reserves will also be in tension with Lockean land, so methods for mediating these tensions are necessary (Cockell 2006; Cockell & Horneck 2004, 2006). Cockell has already suggested a Lockean land-use policy for Mars (2006), but implementation of this policy would result in an unbalanced distribution of freedom and power replicating the existing oligarchical holdings of wealth on Earth, while more deeply entrenching them, especially considering who is likely to be able to go to Mars and exploit its resources (Billings 2019b). A Lockean land-use policy for Mars would simply allow those who get there first to "mix their labor with it," "enclose" it, or occupy it, and thus claim it through supposed "improvements" that come along with such "mixing" or "occupation." A Lockean land use policy for Mars would turn outer space, Mars, and Moon into a new "wild west" of sorts – a frontier to be exploited by the already powerful, often at the expense of the less powerful.

A Lockean land policy, especially used to court investment institutions and financial interests, would give rise to problematic interplanetary relations. Economic incentives inculcate the continuance of particular economic power dynamics, reproducing relationships reminiscent of historical colonialism on Earth, with colonists providing harvesting labor of raw materials for a "mother-country" (or mother-planet). These power dynamics have proven unsustainable, in part

due to the lack of practical political autonomy for the colonial parties, amplified by distance (and Mars is *much* further away than the East Coast of North America is from England).[47] Of course, whether this establishment is done by way of the production of "company towns" for a corporation like SpaceX or comes about as a colony for an Earth-based nation remains unclear, as corporations and private individuals occupy an odd sort of gray zone in the 1967 Outer Space Treaty (Persson 2015; Haqq-Misra 2015a, 2015b).

The implementation of a Lockean land use policy on Mars would comprise the kind of futurism that Murray Bookchin laments (2005).[48] Futurism, as Bookchin argues, takes humanity's current structures, institutions, modes of being, forms of production, etc. and imagines the world in the future with just those same structures in place, but with technological advancements or proliferation, and such a world thereby carries the same structural and social ills, oppression, domination, hierarchy, etc. Bookchin calls for utopianism instead of futurism – imagining a different world, a better world, that we can co-create in mutual human freedom, creating that society together through the process of its creation (Bookchin 2015, 2019). A future that brings technological enhancements to the same modes of exploitation merely makes exploitation more efficient – more value created for the owning class, the same or longer hours for the working class,[49] and wages that are barely sufficient for living, let alone flourishing, forcing the working class to keep working, taking on debt that then debt owners can exploit for their own profits (Proudhon 2008). With further technology and current systems of power we can also expect further technologies of suppression of the people – better surveillance technology, weaponry, etc.

[47] As also noted in Kim Stanley Robinson's *Red Mars*, there are also issues of returning to Earth. Extended periods of time in Martian gravity may make return to Earth impossible for such workers (1993).
[48] Other proposals are at least somewhat aware of potential pitfalls but still imagine or advocate solutions that fall under futurism, whether using cryptocurrency and blockchain solutions for a future space economy (Kennedy 2016) or implementing a Martian tax that shares profits with Earth (Collins 2008).
[49] A day on Mars is longer than a day on Earth (NASA). Considering current trends, expecting that extra time to be used for anything other than an extension of the working day may also be naïve.

Futurism, then, more closely resembles preconceived cyberpunk dystopias, rather than an encouraging future reality (Konstantinou 2019).

IV. Utopia, Solarpunk, and Mars

In the introduction to *The Ecology of Freedom*, Bookchin writes that "[t]his book is not an ideological program; it is a stimulus to thought—a coherent body of concepts the reader will have to finish in the privacy of his or her own mind" (2005: 79). At the end of *The Ecology of Freedom*, he calls for more utopian imagination in picturing what a future ecological society may look like (2005: 411–447). Utopia in outer space will face particular challenges due to the material conditions of space settlements – they may find particular modes of social organizing more stable, amenable, or sustainable, and the environments of space settlements will need to be entirely designed, which provides interesting tensions for the experience of nature *qua* nature within these settlements. This section will imagine utopia in large part through the aesthetic and political movement known as solarpunk, which embraces radical optimism and imagination despite the pessimism of dystopia and capitalist realism.[50] Solarpunk utopianism, I will argue, ought to be a

[50] Solarpunk as a genre is relatively new, and so little has yet to be written on it in formal academic philosophy, leaving much discussion about it to those interested online or in the emerging literary magazines focused on the genre, such as *Solarpunk Magazine*. In fact, a search of the term "solarpunk" on the philosophy database PhilPapers yields only one result, which is a book review from this year, 2022, in the journal *Utopian Studies* (Alberro 2022). The book review is of a collection of short stories in the genre, entitled *Multispecies Cities: Solarpunk Urban Futures* (Rupprecht et al. 2021). "A Solarpunk Manifesto" is available online, outlining core aspects of it as an aesthetic, genre, and philosophy. Juan David Reina-Rozo (2021) provides further history and context of solarpunk, noting its roots in Brazil and that the first call for solarpunk writings wasn't in English (50), as well as highlighting solarpunk themes in *Sultana's Dream*, an imagining of a feminist utopia by Rokeya Sakhawat Hossain (Ibid.; Hossain 2005). Recent solarpunk work includes, somewhat surprisingly, a Chobani commercial entitled "Dear Alice," including a musical score by Joe Hisaishi, a Studio Ghibli composer (The Line, 2021). Incorporating emerging alternative technologies, "Dear Alice," as well as other solarpunk artworks (See, for example, Figure 4.1), have included Buoyant Airborne Turbines (BAT), floating wind turbines that allow for the collection of wind energy at higher altitudes (Bates & Holy 2015). For more examples of the solarpunk art style to better grasp the style and themes, see Figures 4.1, 4.2, 4.3, and 4.4 of the current paper. For short stories, poetry, and visual art in the solarpunk genre, *Solarpunk Magazine* (2022) regularly publishes issues (For more short stories, poetry, or artwork, see also Wagner & Wieland 2017; Rupprecht et al. 2021).

precondition of space settlement, but may also operate counter to the urge to settle space. After presenting solarpunk as an eco-utopian vision I will examine its applicability to settling Mars.

In considering the prospects for utopia in outer space, Christopher C. Yorke "outlines three importantly distinct models of the concept of utopia: (1) the teleological model, (2) the discursive model, and (3) the horizonal model" (Yorke 2016: 61). Yorke ultimately finds the horizonal model to be the most applicable in the context of outer space. Yorke argues that teleological models which conceive of utopia as an ahistorical inevitability and "end-state" of society could hardly find a home among the stars, as humanity is ill-suited for such environments (63). Yorke also finds the discursive model as lacking, since it acts more as a critique of culture, society, and the present through an analysis of *why* particular visions of utopia or dystopia arise in the contexts they arise in (64). Settling on the horizonal model, citing its roots in Ernst Bloch's *The Principle of Hope* (1995a, 1995b, 1995c), Yorke explains that utopia is rooted in hope and that "[h]ope has no final resting place, because we cannot hope for what we already have" (Yorke 2016: 64). As humanity progresses towards one horizon, the horizon moves and becomes new again, and so utopia becomes a kind of target that we can aim for, but an ever-changing target rooted in the hope of a better future.[51]

Solarpunk is an emerging artistic and aesthetic movement, as well as a political, eco-utopian vision for a better future. As defined by *Solarpunk Magazine*:

[51] Writing about property and utopia in *The Story of Utopia*, Lewis Mumford writes of the use of horizonal utopias employing a metaphor of a compass:

> The man who wholly respects the rights of property is kept out of his neighbor's field perhaps even more effectively than the man who is merely forbidden entrance by a no-trespass sign. In sum, we cannot ignore our utopias. They exist in the same way that north and south exist; if we are not familiar with their classical statements we at least know them as they spring to life each day in our own minds. We can never reach the points of the compass; and so no doubt we shall never live in utopia; but without the magnetic needle we should not be able to travel intelligently at all. It is absurd to dispose of utopia by saying that it exists only on paper. The answer to this is: precisely the same thing may be said of the architect's plans for a house, and houses are none the worse for it. (Mumford 1922: 26)

> Solarpunk is a prefigurative, utopian artistic movement that envisions what the future might look if humanity solved major modern challenges like climate change, and created more sustainable and balanced societies. As a genre and cultural aesthetic, it encompasses literature, visual art, fashion, video games, architecture, and more. Solarpunk carries many aspects of punk ideologies such as humanitarianism, egalitarianism, animal rights, decolonization, anti-racism, anti-sexism, anti-authoritarianism, anti-corporatism, and anti-consumerism. Similar to the cyberpunk genre, the big difference between the two is that in solarpunk technology and nature are in harmony with one another rather than in conflict. (Castagnozzi & Norton-Kertson 2022: 114)

Solarpunk exists as an aesthetic style, yet the roots of the solarpunk movement go beyond this into the realm of the political; the aesthetic provides a means by which positive visions of the future and actionable political reform can emerge. Solarpunk visions of the future can also serve a role in environmental discourse. A common critique portrays environmentalists as antagonists - always "against" something - against fossil fuels, against cutting down trees, against building ski resorts, against animal testing, etc., but this critique is itself a bit of a straw man, as environmentalists are often *for* things as well, such as being *for* the implementation of renewable energy, for recycling, for climate reform, for legislation, etc. Perhaps the lack of a clear alternative vision exacerbates issues within contemporary environmentalism – what is the future we want? As an answer, solarpunk minimally provides a utopian heading, approximating a horizonal utopia, if not something actually achievable.[52] Solarpunk also challenges and questions the systems of power that currently exist, whether capitalism, racism, sexism, colonialism, etc., and thus it retains the specifically utopian quality lacking from futurist analyses. Solarpunk is a utopian pursuit coherent

[52] Notably, solarpunk, via the "Solarpunk Manifesto," conceives of itself as a utopian vision that *is* achievable, and not merely a horizon we can aim for and never reach (ReDes).

with the free nature in Bookchin's dialectical naturalism, looking forwards in a way that combines technology and the natural environment (Bookchin 1999, 2005).

Solarpunk ties together the environmental and sociopolitical in a similar manner as Bookchin's social ecology. According to Bookchin, the domination of nature follows from the domination of humans by humans; therefore, addressing sociopolitical hierarchies also involves addressing the problematic, exploitative relationship current society has with nature (2005). Key to an ecological and sustainable society on Earth or Mars is the creation and maintenance of a free society oriented towards justice and community, devoid of hierarchy, domination, and oppression – this orientation should engender positive relationships with the planet, whether blue or red. Furthermore, solarpunk utopian societies would be peaceable, with built-in institutions for collective maintenance of the community.

To build utopia on a sturdy foundation or strive towards a utopian world, the process cannot be ahistorical. Solarpunk tends to recognize history and domination while seeking to address it, defining itself in reference to aspirational decolonial, anti-racist, and anti-sexist activism (Castagnozzi & Norton-Kertson 2022: 114). If utopia is possible, it emerges from our current state and ways of being, and thus, problems with current social injustices need to be addressed in transit and consistently throughout utopia. Addressing aspects of rational discourse, its conception, and its enactment in deliberative forms of anarchic democracy is also necessary in moving onward with such a project (Plumwood 1993: 202).

An anarchistic solarpunk orientation allows for the radical reimagination of the world, with liberatory technology and fosters decision-making oriented towards the freedom of individuals and the ecological landscape instead of prioritizing financial wealth. The economy may be post-currency, letting economics return to its roots to be the maintenance of the home – *oikonomos* –

rather than a game of domination and exploitation (Naess 1990: 104). Dispensing with hierarchy and embracing communal, participatory systems will help to preserve the peace, happiness, and meaning necessary for a good life. Utopianism need not be detached from reality, nor purely fanciful – in both creation and maintenance, utopia takes *work*. Whether utopia is a process as Ursula K. Le Guin[53] maintains (2017), or a sociological method (Levitas 2013) - the place of utopia is in the collective institution of its creation and maintenance. In solarpunk, achievement of utopia emerges through the establishment of institutions which prioritize human freedom through a communal and ecological way of life.

Utopian alternatives *can* exist. We do not need to live in the current world of despair, alienation, and doom associated with the perceived inability to enact changes in society, because of its apparent necessity or inevitability, spawned by capitalist realism. Feelings of hopelessness, as well as urgency, pervade attitudes surrounding climate change, manifesting in the thought, "it doesn't matter what I do" (Jamieson 2014). The emergence of solarpunk utopian thought in art and politics advances the hope for alternative forms of political society which capitalist realism seeks to deny as possible (Fisher 2009). Solarpunk utopianism generates an optimism that drives action and construction, tapping into the urgency felt, rather than the despair; solarpunk utopianism channels a certain kind of optimism needed for action.

In working towards a better future, solarpunk explicitly endorses prefigurative politics, which attempt to instantiate utopian visions in the now by creating and testing visions for future societies (Castagnozzi & Norton-Kertson 2022: 114). A prefigurative political program functions as a kind of "living your revolution." This tends to manifest on the political left, as Luke Yates (2021) observes: "A shift towards broadly anti-authoritarian, horizontal, participatory styles of

[53] Ursula K. Le Guin's 1975 novel, *The Dispossessed*, is often considered an early solarpunk novel (Johnson 2020).

organising in the Left is often understood as prefigurative: network-based, informally organised mobilisations have become normal" (1034). Practice may be a helpful, if not necessary, tool in really creating the shifts wanted in political society (Monticelli 2021). Bookchin expresses a need for prefigurative politics in his "Post-Scarcity Anarchism," writing:

> It is for this reason alone, the revolutionary movement is profoundly concerned with lifestyle. It must try to *live* the revolution in all its totality, not only participate in it. It must be deeply concerned with the way the revolutionist lives, his relations with the surrounding environment, and his degree of self-emancipation. In seeking to change society, the revolutionist cannot avoid changes in himself that demand the reconquest of his own being. Like the movement in which he participates, the revolutionist must try to reflect the conditions of the society he is trying to achieve—at least to the degree that this is possible today.[54] (Bookchin 2004: 11)

Through prefiguration, an ideal finds a foothold in reality. Prefiguration establishes a framework for the kinds of peoples and communities necessary for a utopian vision to be approached or realized on a larger scale.

Solarpunk utopianism provides a positive vision of the future often with reference to a kind of bioregionalism that Bookchin might prefer—entangling with the ecology of one's home and caring for it in league with others in mixed/multi-species communities of the type that Mary Midgely refers to, reveling in the diversity of the natural world (Midgley 1998; Weston 2009;

[54] Of constant concern, linguistically, philosophically, and optically, is the notion of "revolution." It can be a scary term, and is conceived in different ways, and with differing orientations towards the necessity of violence. Bookchin, by and large, does not appear to believe that violence is how we achieve political change or utopia, as first and foremost what we need to do is change the way people see the world and through prefiguration make systems of domination and hierarchy dissolve. Ursula K. Le Guin even writes that "Murray Bookchin was an expert in nonviolent revolution" (Le Guin 2015: 7). Also, of note in Bookchin's analysis here is the focus at the end of "to the degree that is possible today," which recognizes that living one's revolution is limited by one's abilities and material conditions (2004: 11).

McElwain 2016). But what of utopia on Mars, a world with no life?[55] Solarpunk utopianism is in tension with Martian settlements due to the lack of ecology. With a precondition of utopia here on Earth before utopia there on Mars, the question "why leave?" arises. It is unclear what future solarpunk utopians might think of the prospect of settling Mars.

Before extending humanity to Mars or other permanent settlements off Earth, we need to establish the kind of sensitivities, culture, and politics conducive to preventing the extension of our current systems of hierarchy and domination, especially since the extension of these systems to other worlds, or even asteroid mining, will further entrench such systems with more wealth and power. As Weston ponders, "[m]aybe the necessary prelude to actual interplanetary voyages is to found preparatory institutions that will nurture the necessary eco-philosophical attitudes and practices" (2009: 179). The establishment of a utopian world on Earth certainly dilutes the need for escapist fantasies to the stars, and it's unclear that future solarpunk utopian peoples would even want to leave.[56] If humans have inherent exploratory urges (See, for discussion, Yorke 2020), they may instead find satisfaction in adventure exploring Earth and its spaces more – perhaps exploring more unseen or under-emphasized environments, like the deep oceans or cave systems.[57] Still, humanity will face challenges in attempting to settle Mars, even starting from a potential solarpunk utopia.

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[55] Interestingly, one of the first utopian visions for Mars was Alexander Bogdanov's *Red Star: The First Bolshevik Utopia*, originally published in 1908 (1984).

[56] Consider Lewis Mumford's *The Story of Utopia*, writing "The genuine alternative for most of us is that between an aimless utopia of escape and a purposive utopia of reconstruction" (Mumford 1922: 16). The imagined "aimless utopia of escape" is the escapist futurism proposed by current settlement plans, as opposed to the purposive utopia intentionally created with utopian visions in mind that engage the imagination deeply. Compare with, "The utopia of reconstruction is what its name implies: a vision of a reconstituted environment which is better adapted to the nature and aims of the human beings who dwell within it than the actual one; and not merely better adapted to their actual nature, but better fitted to their possible developments. If the first utopia leads backward into the utopian's ego, the second leads outward—outward into the world" (Mumford 1922: 21).

[57] Weston's philosophical "Mission to Earth" may serve as a methodology for awe, wonder, and adventure both today, and in some solarpunk future (Weston 2009c: 169-173).

Politically, Charles Cockell highlights the distinct possibilities of tyranny in space settlements, owing to the material conditions therein (2009; 2013; 2015). Existential problems like a lack of oxygen and other resource scarcities threaten the success of space settlements. The constant threat of death from the Martian world outside the space settlement poses a political risk as well, as the settlers may trade liberty for security.[58] The misconception that current political and economic systems must be extended to space settlements fails to consider alternative political futures, and additionally wrongly assumes that our current systems of governance will still exist in a similar form in the future where space settlement is logistically possible. It is possible that current political systems may not exist in part due to the failures of those systems; capitalism and statehood threaten nuclear war, environmental destruction, perhaps violent revolutions that lead to more tyranny, etc.[59] Space settlements may seem idealistic, but the realization of the ideal can be approached in the implementation and adaptation of utopian ecological frameworks. Threats to the possibility of future space settlement entail pursuing the routing out of tyranny and other systems of hierarchy and domination here on Earth *now,* otherwise we might not make it to Mars. Solarpunk visions of the future may function to address these systems in its realization.[60] If current systems of statehood, etc. do survive into a future where space settlement is imminently possible, it is unclear that we should want their extension to Mars, as it would only serve to further complicate international affairs while reinforcing international inequality between spacefaring and non-spacefaring nations. Furthermore, there are other risks associated with military establishments

[58] James S.J. Schwartz (2016) has a wonderful piece on labor relations in extraterrestrial settlements dealing specifically with oxygen and carbon-scrubbing technology, highlighting questions of under which conditions it may be permissible for essential workers to strike. Of course, such a piece perhaps relies on particular presuppositions about the economic makeup of such settlements, and whether space settlements ought to even involve wage-based economies, private property, or capitalist modes of production and the like is also questionable.

[59] For discussion and comparison of space travel timelines with climate change impact timelines, see Kennedy 2016.

[60] An important side note here is that it is quite possible, though not definite, that the inhabitants of a solarpunk utopia will have no desire to settle other planets at all – space settlement as an *escapist* fantasy will likely no longer be operative; however, scientific curiosity might at the very least remain.

off world if political relations between planets or nations turn ugly; for example, due to differences in gravity it would be easier to fire interplanetary rockets from Mars than Earth, essentially giving the higher ground to Mars in a potential interplanetary war (Deudney 2020). The establishment of alternative systems of social organization on Earth that tend towards freedom, consociation, communality, etc., ought to be established and extended, perhaps also as a sustaining necessity to cope with climate disaster.

For settling Mars, Haqq-Mirsa (2015a) proposes both Martian liberation and planetary citizenship, where Mars does not acquire a colony status in relation to Earth or any one country. Those moving to Mars, under Haqq-Mirsa's proposal of a liberated Mars, must renounce citizenship to Earth, economic ties, conflicts of interest, etc., to keep the politics of Earth out of the complicated and fragile world of budding Martian settlements and civilization. Martians will then also be the only ones to determine land use, etc. on Mars; Mars will be allocated a significant degree of sovereignty. Haqq-Misra's proposed alterations to the Outer Space Treaty (1966) would prevent Earth and Mars from developing the colonial relationship that plagues previous colonial-settler projects on Earth. Haqq-Misra argues that humanity may use Mars to experiment with political organization. Imagining Mars as a blank canvas for experimentation, these experiments can then inform and transform political conventions on Earth (Ibid.).[61] While seemingly utopian,

[61] If viewing Haqq-Misra's proposal as a kind of utopianism for Mars (though it is ideologically vacuous as compared to utopian visions, generally), his view represents a kind of "utopia there before utopia here" compared to my "utopia here before utopia there." Notably, Haqq-Misra's proposal, if we assume his proposed changes to The Outer Space Treaty are adhered to, may avoid some of the arguments put forth in Section III – without economic ties between the two planets, it is possible that the establishment of settlements on Mars will *not* further entrench hierarchical power structures on Earth, but that may depend to some extent on the public policies enacted for supporting the colonization of Mars – with current economic structures in place, somebody has to pay and somebody has to get paid. There are, however, still the concerns of getting to Mars before we make such a venture practically impossible from the effects of climate change (Kennedy 2016), so practically, setting up a solarpunk utopia here before "utopia there" might be a necessity.

using Martian settlements as a means for political development and innovation face problems compared to the solarpunk utopianism argued for in this paper.

Haqq-Misra's proposal is ahistorical in a manner that solarpunk is explicitly historical. The move to Mars with its formal political separateness provides a dangerous and faulty appearance of a lack of Earthen history and influence. Without prior development away from hierarchy before beginning civilizations on Mars, the experiment ignores the baggage settler-experimenters would be taking with them, allowing for its likely reproduction, especially if the conditions for who can go are not made carefully and explicitly (who are likely people from industrial, spacefaring countries). In combination with the material conditions and aforementioned issues of resource scarcity, current sociopolitical attitudes may be likely to result in tyranny or despotism, hardly an export Earth should want more of (Cockell 2009; 2013; 2015). Even if tyranny is avoided, it is possible that the differences in material conditions yield a politics unfit for export to Earth. And while, of course, humans on Earth engaging in political activities also carry with them some of the same social, political, and psychological baggage that Martian colonists would on Haqq-Misra's proposal, the solarpunk envisioning explicitly formulates itself in a manner that is historical by being punk – to reiterate, "Solarpunk carries many aspects of punk ideologies such as humanitarianism, egalitarianism, animal rights, decolonization, anti-racism, anti-sexism, anti-authoritarianism, anti-corporatism, and anti-consumerism" (Castagnozzi & Norton-Kertson 2022: 114). Angela Dapremont (2021) comes to a similar conclusion regarding Haqq-Misra's proposal, finding one of its insufficiencies its lack of a social justice orientation, as well as its lack of formal environmental protections for Mars (there is no guarantee of planetary parks as what happens to Mars is up to the Martians) (Dapremont 2021: 7).

A further issue with Haqq-Misra's proposal of a liberated Mars as compared to the solarpunk utopia is on the question of which is more politically promising. For one, the project of a solarpunk utopia explicitly works to save Earth's ecology and works explicitly at securing human freedom, whereas the liberated Mars plan "rolls the dice" on getting something transformative from the settler experiments. More importantly, the manner in which prefigurative praxis seeks coherence between its means and ends (e.g. "living your revolution," by actively creating and participating in the social and political structures that you want to see in the world) can serve more directly to influence those on Earth, especially compared to how those far off on Mars may be viewed; that the Martians live in an entirely different context, they may be seen as an uninstructive source for guiding Earth's politics. Prefigurative praxis may also take the form of public goods, such as community organizing, community gardens, community meals, or the classic "anarchists filling potholes" (for anarchists filling potholes, see Dubois 2017). These actions affect others materially, expose and involve people in novel political programs, and improve the material conditions for the community. The ability to interact with people in one's community and talk with one another face-to-face may have more transformative potential for politics on Earth compared to some experiment on Mars.

While I agree that we ought to have a liberated Mars (though I am, perhaps, uneasy with the notion of citizenship of the sort that Haqq-Misra has in mind), such a project ought only to be undertaken by peoples that are ready, and we're simply unprepared socially, politically, and psychologically for the endeavor (Billings 2019a, 2019b; Marino 2019). Before moving forward with settling Mars, we must first become the kind of people that could settle Mars successfully without exacerbating current social, economic, and political ills.

In imagining the social organization of Martian settlements, the manner of living would likely be cooperative to ensure the safety of the colony and because space itself may be scarce, and community-oriented solarpunks would be oriented towards that manner of organization. Due to reasons of efficiency, life in the colonies would likely be plant-based and keep waste to a minimum via maximal recyclability, things also coherent with solarpunk.[62] Life would be, to some significant extent, always under at least a passive threat from the hostile wilds beyond the walls/dome/regolith[63] where humans could not survive (assuming colonies *sans* global terraforming), and the separateness from Earth would, ideally, require that safety be maintained through cooperation. Furthermore, interplanetary politics would need to be settled in a way that granted autonomy to the settlement to avoid importing any remaining relations of conflict on Earth on these worlds, and so I endorse Haqq-Misra's (2015a) account on that regard.

Prefigurative politics fits neatly within the move towards the establishment of space settlements not only for testing and experimenting with meaningful democratic methods of decision making and community, but also because of the likely necessity of prefabrication. A variety of options are available and in development for the manufacture of Martian settlements, but primary tools in current discussion include artificial intelligence and 3D printing technologies. Martian landscapes contain a multitude of elements hostile and antagonistic to human survival and

[62] There might be an underlying issue here for future solarpunk utopians regarding settling space and maintaining the multispecies communities that will characterize Earth-based societies. Solarpunk utopians might think that it would be unethical to bring or breed other-than-human animals (or maybe even plants) to space environments. This position might make the actual ecological sustainability of Martian settlements an impossibility without advancing farming, pollination, or management methods. Solarpunk utopians that value living in community with other-than-human animals and hold that bringing them to outer space would be unethical would have another reason to not leave Earth. The potential "space-faring Midgleyean 'mixed communities'" that Weston imagines may not be a coherent ethical possibility for solarpunk utopians (Weston 2009c: 179).

[63] Regolith refers to, essentially, Martian soil. Soil is often defined as consisting of both organic/biotic and inorganic/abiotic components, whereas regolith only consists of inorganic/abiotic components. Thus, the outer crustal layer of Mars and the Moon properly consists of regolith, not soil (Milligan 2015). Regolith is mentioned here in part because in *Red Mars* (1993) the first settlement built was called Underhill, built under the Martian regolith to minimize radiation concerns.

comfort; however, robots on the surface of Mars have fared much better than expected (Morton 2018). Robinson's *Red* Mars (1993) introduces technology that manufactures materials form Martian regolith. The implementation of 3D printing technologies which engaged in this type of resource extraction would alleviate the logistical difficulties of consistently importing raw materials from Earth. Martian settlements may be built above or within the regolith, their being built without much in the way of human presence would be ideal (Morton 2018). These technologies, depending on their development, might also fit with a living with the land kind of ethos, and one that could be reflected in the architecture.

The ability for a settlement to develop without human presence over perhaps centuries, allows for the possibility of the ecological development of the settlements as well. One could imagine, for example, the introduction of various plant species, and allowing their growth and development into a self-sustaining system, theoretically over centuries, creating a climate and breathable atmosphere without human settlers. In thinking about time, patience is appropriate – why assume anything needs to happen within a single human lifetime and not over centuries (Weston 109-130)? Additionally, implementation of alternative growing systems provides the opportunity to set up sustainable farming practices from the conception. If left for centuries, we'll have initiated the creation of an odd sort of environment, not native to Mars, but also perhaps not entirely an artifact, as naturalness might be able to wash back into an ecosystem even created on Mars given a long enough time period (for a discussion of naturalness, see Woods 2017). In designing these spaces for humans, the use of utopian architecture and solarpunk visions may also help with arranging the physical space to be one conducive to communality and interaction, something which will be very important for the psychological well-being of potential Martian settlers in such an isolated world. Further design concerns regard ability and disability in outer

space environments, and construction should prioritize universal access (Wells-Jensen, Miele, & Bohney 2019).

Kim Stanley Robinson's Mars Trilogy (1993, 1995, 1997), explores a speculative future in which an ill-planned Martian settlement project becomes politically and environmentally catastrophic. In *Red Mars* (Robinson 1993), Earth's climate is in trouble and overpopulation threatens the globe, causing resource scarcity and war. Martian colonies are seen as a potential pressure release for Earth to cope with the population crisis. Labor issues, political corruption, police brutality, crime, etc. all increase with the influx of people, exacerbated by a lack of prefigured political structure, especially in relation to the handling of multinational (or, perhaps, multi-planetary) corporations and their "security forces." The subsequent "revolution" and suppression highlight many of the safety concerns that could arise in Martian colonies – life is extremely contingent and life-sustaining systems are fragile. Redundancies would need to be in place, but even still, a simple failure could lead to the death of everyone in a settlement. The need for explicitly considering the politics and humanity being ready to engage politically in another world is of paramount importance for a Martian settlement project. *Red Mars* (Ibid.) begins with a fractured political climate within the first hundred settlers from the start. While all the first hundred are scientists or engineers, they tend to take one of three political positions: there are those that embrace the opportunity for a new politics on a new world with the establishment of a new culture separate from that of Earth, those retaining politics of the past and looking at Mars in large part as a means to gain political and economic wealth through ties to Earth, and those who are uninterested in politics and thus attempt to sustain a sort of apolitical focus on science. Those that might be humanity's potential settlers ought to be, in fact, equipped for such a mission politically – the blending of the sciences and the humanities would be of extreme importance, as both the

humanities and politics would be essential to the existence and sustainability of any scientific project, especially in a fragile settlement structure.

In stark contrast to futurist visions offered by those wishing to extend current political, economic, and social structures to Martian settlement or colonization, solarpunk utopianism offers an optimistic alternative, though one that may be conducive to settlement practices and politics, but not settlement attitudes. If humanity is to move forwards with a project of settling other worlds, we need to be prepared so that we do not exacerbate or replicate current problems of hierarchy and domination – utopia here before utopia there.

V. Conclusion

Linda Billings (2019a; 2019b) argues that humanity is not ready to colonize outer space in part due to the ideologies of conquest and exploitation that have dominated space exploration up to this point, as well as life on Earth, noting problematic Christian dominionistic trends in the logic of space colonization. Billings concludes that humanity first needs to learn to live peaceably on Earth before moving out to other planets, noting that we are currently both technologically and socially immature for such a project at the current moment (2019a). Billings concludes with the assertion that "the ideology of space exploration is in need of rejuvenation" (2019a: 49). Lockean land use policies, the exporting of current social and political relations to other worlds, and the creation of potential corporate strongholds off Earth for exploiting the resources of the solar system would make all current problems worse. In moving forward, as a precondition to creating such new worlds, we ought first address issues on Earth, building the kinds of societies, cultures, and institutions that could one day take part in a successful project of space settlement. These future societies ought to be radically different utopian imaginings, especially ones that highlight non-

hierarchical, ecological ways of living, like solarpunk and social ecology. Even with an eye towards settling space, addressing our current social, political, and economic dysfunctions is an important step in ensuring the environmental, economic, and social sustainability of any potential future off Earth settlements.

Figures:

Figure 4.1: "The Future is Bright," by Jessica Woulfe. Grand prize piece from the Atomhawk solarpunk art contest.

Figure 4.2: David Batsita's entry into the Atomhawk solarpunk art contest, taking second place.

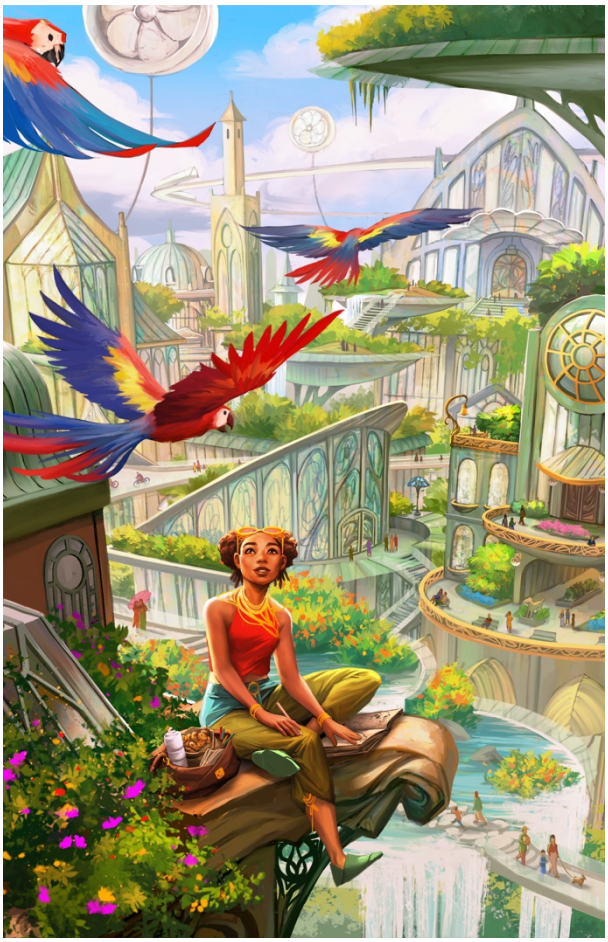

Figure 4.3: “Solarpunk” by Rita Fei. Appears as the cover are to *Multispecies Cities: Solar Punk Urban Futures* (Rupprecht et al. 2021).

Figure 4.4: “The Fifth Sacred Thing” by Jessica Perlstein. Concept art.

CHAPTER 5

Conclusions

The intersection of philosophy and space exploration is still a relatively new area of inquiry. To conclude, I will provide a brief overview of the implications of chapters 2 through 4 of this dissertation, highlighting what each adds to the literature in this growing field while outlining potential avenues for further development.

Chapter 2 argued for a novel account of moral status that may apply to many celestial bodies, as well as extraterrestrial organisms. As we continue to learn more about outer space, the NETT+NFT account will provide a means for assessing who or what qualifies for moral consideration in deliberation. This account may also apply neatly to Earth-based ethics as well. An account of moral status is, however, only one part of a full moral theory, which also needs a more explicit normative framework, as well as a clear analysis of the metaethics underlying it. While Chapter 2 points to some potential directions, namely, a modified accounting of W.D. Ross's ethical theory (1930, 1939) and the adoption of a fitting attitudes theory of value (Rabinowicz & Rønnow-Rasmussen 2004; Jacobson 2011), more needs to be said in fully explicating how these parts might all fit together into a coherent whole.

Chapter 3 argued that Mars, as well as many other celestial bodies, qualify as wilderness under a modified version of Mark Woods's wilderness ethic (2017) and that because Mars qualifies as wilderness, we ought to extend wilderness protection to Mars. This chapter also critiqued and expanded upon a current planetary park proposal (Cockell and Horneck 2004, 2006). While the chapter presented potential boundary criteria for parks and suggested a methodology, next steps

would include engaging GIS analysis and arguing for particular protection policies for different parks, as geographic differences instill differences in reasons for protection (e.g., aesthetics, transformative experience, astrobiological research, etc.). Thus, different areas may call for differences in systems of protection.

Chapter 4 argues against futurist proposals for Martian colonization, highlighting Charles S. Cockell's proposal for a Lockean land use policy for Mars. I argue that this proposal would result in continuing and exacerbating of current social and political issues on Earth. Employing the distinction between futurism and utopianism made by Murray Bookchin (2019, 2005: 431, footnote), I argue that proposals like Cockell's (2006) embody a futurism that unquestioningly extends current political regimes to the future. Instead, building on Bookchin's call for more utopianism (2005: 411–447), I argue that we ought to embrace utopian solarpunk imaginings. Solarpunk is an emerging artistic and aesthetic movement, as well as a political, eco-utopian vision for a better future. I argue that to be fit to settle Mars, humanity must first establish something like a solarpunk utopia on Earth to avoid extending problematic systems of hierarchy and domination; before settling other worlds, humanity must first address issues on Earth to ensure that we do not export these ills to new worlds. Further analysis of solarpunk is certainly needed, as it is still a youthful genre about which little research has been done; alongside the study of solarpunk, more solarpunk artwork ought to be created to bring this vision of the future to our present and cultural consciousness. The framework of analysis employed in Chapter 4 can also be applied and developed in response to other proposals for settling space other than the Lockean land use proposal from Cockell (2006).

A common thread throughout this dissertation is an emphasis on slowing down and taking time to think and consider other possibilities, even when the answer may appear obvious – what

could be wrong about terraforming, developing, or settling a dead planet like Mars? As argued, a lot! Science and technology progress at a rapid pace, and there is a need for cooperation between the sciences and the humanities to work towards addressing issues of our time and beyond.

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