The Animal Ethics of Spreading Life Off-Earth

Abstract

Creating extraterrestrial biospheres by spreading life to other celestial bodies could produce vast numbers of sentient animals subject to severe harms typical of wild ecosystems (starvation, diseases, etc.). I assess three pro-creation arguments—the "logger argument," claims that nature contains more pleasure than suffering, and appeals to non-welfarist values (e.g., intrinsic ecosystem worth or "meaning")—and argue none justifies replicating wild ecosystems, given the substantial risk of widespread suffering. I do so by appealing to views far less specific than classical utilitarianism plus negative net wild animal welfare, unlike most previous critiques. I conclude that animal ethics gives us reasons against spreading life off-Earth.

Keywords: space ethics, terraforming, planetary protection, directed panspermia, wild animal welfare

1. Introduction

Planetary ecosynthesis is a process by which another celestial body could be intentionally transformed to be habitable for humans (Averner & MacElroy 1976;

Graham 2004; McKay 2009). It would notably necessitate biological engineering to seed living organisms and develop a biosphere that replicates Earth's (Haynes & McKay 1992; Graham 2004), a sub-process often captured by the notion of *biological terraforming*. The concept of planetary ecosynthesis is closely related to that of *terraforming* (McKay 2009). Some have advocated for terraforming (see, e.g., Sagan 1961; 1973; Oberg 1981; McKay 1982; Lovelock & Allabi 1984; Fogg 1995; 2011; Beech 2009; Zubrin 2011; Kaku 2018; Musk 2018; DeBenedictis et al. 2025) or, more specifically, for giving other celestial bodies a biosphere, whether via biological terraforming or *directed panspermia* (see, e.g., Averner & MacElroy 1976; Graham 2004; Mautner 2000; McKay 2009; Haynes & McKay 1992; Palhares & Almeida dos Santos 2014; Gros 2016; Sleator & Smith 2019; Owe 2023). Others have argued, however, that the achievability of these interventions is uncertain (see, e.g., Jakosky & Edwards 2018; Forget et al. 2025).

A wide variety of moral concerns have already been raised concerning the terraforming of another celestial body—see, e.g., Normier et al's (2025) recent "call to address humanity's cosmic footprint". The vast majority of these worries are based on the scientific importance of *planetary protection* (see, e.g., Persson 2012; Stoner 2017, §3; 2021, §6.3.1; Munévar 2019; Schwartz 2019; 2020) or on the claim that there may be intrinsic value in unaltered alien life or outer space environments (see, e.g., Rolston 1986; Lee 1994; Persson 2012; McMahon 2016; Stoner 2017, §4; 2021, §6.3.2; Milligan 2018; Matthews & McMahon 2018; Sivula 2024). What I will focus on, in this paper, is a third and substantially different type of concern that specifically regards the creation of

new biospheres (rather than terraforming per se) and that has to do with the ethics of knowingly bringing wild animals into existence. Despite the popular romanticized view of nature and life in the wild many of us may entertain (Faria and Paez 2015; Waldhorn 2019), the overwhelming majority of sentient wild animals existing at any instant will never reach adulthood. Instead, they die at a young age, often by starving or dehydrating to death, falling victim to parasites or viruses, or succumbing to injuries (Ng 1995; Horta 2010b; 2015; Tomasik 2015; Faria and Horta 2019; Johanssen 2020; Soryl et al. 2021; MacAskill 2022, p.284; Kahane 2023; Singer 2023, Chapter 6). If we were to seed another celestial body with life in a way that eventually gives rise to sentient creatures, there is—a priori—no reason to believe they would suffer any less than wild animals on Earth.

Nevertheless, one can argue that it would be in the interest of such organisms to be brought into existence.[1] I argue the opposite while remaining agnostic regarding the feasibility of giving any other celestial body a biosphere. I proceed as follows. In §2, I examine and reject the *logger argument*, which claims that opposing the creation of extraterrestrial sentient life commits us to eliminating wild animals on Earth. In §3, I consider and reject the *argument from positive animal welfare*, which holds that nature contains “more pleasure than suffering” and that this is what matters. §4 addresses appeals to *prevailing non-welfarist values*, such as the intrinsic worth of life or ecosystems, arguing that these cannot justify large-scale suffering—a crucial question

[1] One can also argue that, even if such creatures would be better off not existing, it is a downside compensated by the indirect benefits—of spreading life—for humanity. I, however, limit my focus on the interests of the animals that may directly result from humans artificially seeding life on other planets—although I briefly touch upon whether spreading life off-Earth could be good, all things considered, in §6.

in environmental philosophy. §5 defends the assumption—central to my rejections—that replicating Earth's biosphere would also replicate substantial suffering, drawing on evolutionary considerations. §6 concludes by summarizing my case against creating off-Earth ecosystems and noting its implications beyond the very topic at hand.

2. The logger argument

Consider this formulation:

> **The logger argument**: If we thought replicating life off-Earth was unethical because of how tormenting the wild is for the creatures that live in it, this would imply we should euthanize all wild animals, or dispense with wildlife on Earth some other way, which seems blatantly wrong—and that is because we think we must value the existence of (more) wildlife despite its callousness.

While it seems that this exact argument has never been made in the literature,[2] some versions of it are very commonly made in informal discussions on the animal ethics of biosphere creation. I call it the "the logger argument" in reference to John and Sebo's (2020, §4) discussion of what they call the "logic of the logger" to define the idea according to which we should destroy wild animal habitats for the good of wild animals.

[2] Ćirković (2019) writes "[I]f humanity refrains from space colonization and inevitably goes extinct—due to either local Hobbesian warfare or a natural cataclysm—wild animals will (surprise, surprise!) continue to be subject to "Darwinian misery" on Earth and on infinite number of other habitable planets in the universe [for reasons independent from humans]." However, it is unclear what Ćirković's point is, here, and whether it implicitly is some version of this logger argument.

I defend that this *reductio ad absurdum* argument fails. There are many defensible sets of normative and empirical beliefs that condemn conceiving a child while intending to abandon them without endorsing killing all orphans. Similarly, there are many defensible sets of views that would condemn replicating life off-Earth without endorsing eliminating all Terran wild animals. Most people would agree that killing orphans or wild animals would be ethically disanalogous to abstaining from creating totally new ones. For instance, as John and Sebo (2020, §4) suggest, it seems highly plausible that "exterminating animals negatively shapes our individual beliefs, values, and practices, and [that] living without wild animals altogether negatively shapes our collective beliefs, values, and practices", even if we think that the process that led to their existence lacked an ethical basis. Even more commonsensically, we may also think that it would be immoral to kill beings who seem to want to avoid death in the vast majority of cases. Those are only two examples of seemingly quite sensible reasons to condemn killing beings—reasons which are far from incompatible with also condemning voluntarily creating more of them (see, e.g., Benatar 2006; McMahan 2009; Grill 2016; Rully 2024).

3. Positive wild animal welfare?

The argument may be formulated as follows:

> **The argument from positive wild animal welfare**: What dictates whether bringing wild animals into existence on other celestial bodies is in their interest is whether there is "more pleasure than suffering"[3] in nature, and there likely is.

[3] This implicitly assumes a hedonic view over what we mean by *welfare* in ethics—see, e.g., Haybron (2020) for an overview on different ethical interpretations of welfare—which is what those who have

Godfrey-Smith (2024) makes a similar case, although in a totally different context—that of rewilding (on Earth). Sebo (2023, §6) implicitly suggests that such an argument is at least plausible by arguing that (classical) utilitarians should consider terraforming to create as many happy "(post-)nonhumans" as possible.

There are two different claims in the argument from positive wild animal welfare. Both are necessary to support the overall statement, with which I see three potential major problems. The first two problems I discuss have to do with *"more pleasure than suffering"* as an ethical criterion (i.e., with the first claim), and the third one with whether such a criterion is met (i.e., with the second claim).

1) **Too permissive**. The idea that the necessary criterion for creating new sentient beings is merely the expectation that they will collectively feel "more pleasure than suffering" may seem—independently of how this can reasonably be interpreted—unfairly non-demanding (O'Brien 2021, §3.3), especially given the irreversibility of such an act.[4] Bringing someone into existence exposes them to hardly avoidable risks and harms which they cannot consent to, gives them no

defended something in the vicinity of this argument have always done so far. However, I believe my objections to this argument would apply just as well to a non-hedonic version, e.g., if "more pleasure than suffering" was replaced by "more satisfied preferences than frustrated ones".

[4] If life were to be successfully seeded on another celestial body and started spreading all over it like it did on our planet, it could survive and develop itself for trillions of years, effectively creating some duplicate of Earth. This new biosphere could be just as resilient as ours, and very plausibly even more since it would likely be intentionally engineered to be as resilient as possible, in order to maximize the chances of success of the seeding project. Therefore, if humanity decides to carry on such a project, there would hardly be any coming back from this decision. We would have effectively created another world. In the meantime, if humanity abstains from pursuing such a project, it could still very well change its mind later on. There is a clear option-value asymmetry, giving us reasons not to create other biospheres unless the case for it is rock-solid (in a way that justifies the risk of taking a hardly revocable action). In the present paper, I strongly suggest that it is not.

easy “way out” once born, no opportunity to choose who raises them, etc. (see, e.g; Velleman 2008; Benatar 1997; 2006; McMahan 1998; 2009). Scholarly discussions vary widely regarding the criteria under which bringing new beings into existence is or isn’t acceptable[5] and many plausible criteria more demanding than that of merely “inducing more pleasure than suffering in expectation” have been and can be proposed (see, e.g., Velleman 2008, p.251-254; O’Brien 2021, §3.3; Rulli 2024). The “inducing more pleasure than suffering in expectation” criterion is controversial, particularly when applied interpersonally in population ethics. This is shown by discussions of thought experiments such as that of whether to create Le Guin’s ([1973] 2017) city of Omelas where the happiness of most inhabitants relies on the perpetual agony of one child (see, e.g., Knapp 1985; Vinding 2020, §3.3), illustrating what is known in ethics as the *scapegoat problem* or the *scapegoat objection* to classical utilitarianism.[6] Also, one might want more demanding procreation criteria, not for the aforementioned ethical reasons, but for epistemological ones. One might not accep expected value reasoning or versions of it that are not risk-averse (see Tarsney et al. 2024, §2), or think we are too clueless to have determinate expectations to begin with (see Tarsney et al. 2024, §3), in a way that calls for more precaution in the face of hardly reversible acts such as spreading wildlife on another celestial body. See, e.g., Askell and Neth (forthcoming) and MacAskill (2022, p.133-134) on the importance of *option value* in situations of deep uncertainty with a lot at stake.

[5] Brake & Millum (2022, §2-3) and Arrhenius et al. (2024) give comprehensive overviews.
[6] Of course, all the aforementioned authors—except for O’Brien—focus their discussions around human cases. However, considering their points as relevant for humans but irrelevant for all the other animals that can also experience pleasure and suffering would be a purely speciesist double standard (O’Brien 2021, footnote 23) which seems arbitrary (see, e.g., Singer 2023; Horta 2010a).

2) **Too vague**. Assuming we accept "inducing more pleasure than suffering in expectation" as a sole criterion for the ethical creation of other beings, there would still be severe empirical and normative disputes[7] over what "more pleasure than suffering" should exactly mean, here. Some would agree this is what matters when phrased so vaguely but have drastically different views regarding what kinds and amounts of pleasure offset what kinds and amounts of suffering,[8] especially at the interpersonal level, leading them to highly divergent opinions on whether pleasure outweighs suffering in nature. For instance, one may think that the pleasure felt by, e.g., a fish or turtle when she eats food makes up for the early agonizing deaths of most of her siblings (see Mikkelson 2018, p.105). Meanwhile, someone else may think that, while pleasure can outbalance suffering in theory, there are some experiences of excruciating agony (e.g., burning alive in a wildfire) that cannot be compensated for by any amount of pleasure (see, e.g., Crisp 2022; Mogensen 2024). Many similar and other positions can be endorsed by someone who thinks about ethics in terms of "pleasure minus suffering", all potentially leading to very different conclusions regarding what is or is not morally desirable (see, e.g., Vinding 2020, Part I).

3) **A hardly-met criterion**. Even assuming we have somehow overcome the above two problems, one still needs to demonstrate that nature would indeed contain

[7] The empirical and the normative also appears hardly dissociable, in this context.
[8] In fact, the comparability of suffering and pleasure on the same scale are very controversial among those who studied well-being in philosophy and economics, especially interpersonal comparability (see, e.g., Vinding 2020, part I; Harnad 2016; Belshaw 2016; Ng 2015; Samuelson & Nordhaus 2010, p.89; Miller 2011, p.437). A thorough treatment of the question of the measurability of pleasure and suffering on the same scale, in particular, has informally been given by Knutsson (2018).

> “more pleasure than suffering”. This idea finds some support in Mikkelson (2018), Browning & Veit (2023), as well as in York (2024) if we consider only individuals that belong to the category *vertebrate* (or at least only the vast majority of them, which belong to that of *fish*). However, their arguments seem weak and call for uncertainty at best. We would need far stronger evidence than has been provided so far to suppose that there is “more pleasure than suffering” in the wild (Soryl et al. 2021, p.11; Browning & Veit 2023, §Conclusion). This evaluation seems especially warranted given how much more intense negative experiences seem to be compared to positive ones for most (if not all) sentient wild animals (see the references in the second paragraph of §1) and the systematic reasons to expect suffering to be unusually common in creatures deeply affected by natural selection (see §5).

4. Prevailing non-welfarist values?

A representative formulation is:

> **The argument from prevailing non-welfarist values**: What dictates whether bringing wild animals into existence on other celestial bodies is in their interest is whether some welfare-independent good(s) (e.g., the intrinsic value of wildlife) justifies the serious suffering this would cause, and it likely does.

No one seems to have openly defended this in a way that explicitly acknowledges the entailed suffering. However, as shown in what follows, some have made arguments that

imply such a position, or that would imply it if extrapolated in some manner. Also, Sivula (2022, §4.2) sketched a version of the argument (without defending it) that does explicitly acknowledge the entailed suffering:[9]

> In response to the risk of suffering objection, one could argue that a galaxy with life is better than one without life precisely because of this feature. According to this line of thought, a galaxy with life would be better as a whole simply because there is life, even if there were more suffering than happiness. However, this response fails to convince those who are worried about suffering, to begin with, unless one is a value pluralist and assigns a very significant and high value to life's existence.

The argument from prevailing non-welfarist values is the same as that from positive animal welfare except that, in “more pleasure than suffering”, *pleasure* is replaced by whatever non-welfarist component of wildlife someone might intrinsically value.[10] Contenders for such non-welfarist goods, purportedly capable of morally offsetting suffering, that have been proposed in similar contexts include life itself and/or ecosystems (see, e.g., Rolston 1975; 1988; Agar 2001; Taylor 2011; Rootman 2014; Owe 2023; Baum & Owe 2024; Soryl & Sandberg 2025; Mautner 2000; Sivula 2022, §2; Sivula 2025, §4), wild animals’ “sovereignty” (see Donaldson and Kymlicka 2011, §6;

[9] See also Sivula (2025, §4).

[10] One may also very well value both pleasure and non-welfarist goods, allowing them to make an argument that is not quite that from positive animal welfare or that from prevailing non-welfarist values but a mix between the two (Sivula 2025, §4). I hope it is clear that my objections to both also apply against such a hybrid argument (although they would seem weaker in the eyes of someone who thinks that *value* would likely outweighs *disvalue* simply because there would exist many valuable things and only few that are disvaluable).

Wise 2023), and some positive “meaning” their lives could have (see Gardner 2022). Applied to the context of spreading wildlife off-Earth—which, to be clear, is not how the argument is applied in the cases of Agar (2001), Taylor (2011) Rootman (2014), Donaldson and Kymlicka (2011, §6), Wise (2023), and Gardner (2022)—such an argument shares all the problems of the positive wild animal welfare argument. For the sake of brevity, I will here exclusively focus on “meaning” as an example of a potential non-welfarist good, but I believe my point applies just as well to any other (or any combination of them). “Inducing more ‘meaning’ than suffering” as an ethical criterion for procreation is at least as assailable as that of “inducing more pleasure than suffering” (see §3). Some versions of my objections to the argument from positive animal welfare seem to apply just as well, if not even more given the epistemological nightmare of attempting to measure some non-welfarist good like “meaning”—especially on the same scale as suffering—in order to allow trade-offs between the two. Moreover, there also is a strong sense of presumptuousness and of severe lack of compassion associated with the idea of declaring in the name of someone else that they ought to be brought to life because of some perceived positive implication that has nothing to do with their welfare, i.e., with how living would feel to them. Such sentiments plausibly suggest that something has gone wrong in the reasoning leading to endorsing something like the argument from prevailing non-welfarist values. Relatedly, Sivula (2025, §4) writes (emphases are his):

> As there is uncertainty about wild animal suffering but also uncertainty about environmental values, it could be wrong or reckless to take a risk of creating vast

amounts of *known* bad (suffering), in order to promote a *plausible* good (living organisms, environmental wholes, or the continued existence of Earth-originating life).

5. Spreading life without (significant) suffering?

While, in principle, a new biosphere does not need to involve as many early agonizing deaths and other severe troubles as Earth's to sustain human life, the commonality of suffering appears to be an inherent and hardly avoidable feature of wild ecosystems.

First, there seems to be no good reason to expect wild creatures resulting from human-driven biosphere creation to, by default, suffer less (or more) than wild animals on Earth, given i) the absence of any data point other than what we know has happened in nature on our planet so far;[11] and ii) the fact that these creatures would be engineered—or descend from those who have been engineered—by humanity with what exists on Earth. O'Brien (2021, §2.4) makes a similar argument, although he raises only (i) and not (ii).

[11] Alluding to a similar point, Kovic (2021, §4.3) writes that "in the history of Earth, wildlife suffering has not really improved at all, so astronomical wildlife suffering would likely represent a constant source of disvalue.". Faria (2023, p.183) also seems to be making a similar assumption when she writes: "In a world indifferent to wild animal suffering, it is highly likely that a terraformed planet, by recreating current Darwinian ecosystems, world harbor as much or more suffering than currently exists on earth. If humans decide to embark on such enterprises of ecosystem engineering and spread life to other planets, suffering is likely to multiply on an astronomical scale".

Second, in a scenario where the wildlife that would populate biologically terraformed bodies evolves from in situ natural selection (e.g., because humans seeded bacteria and “let evolution do the rest”), we should expect substantial suffering to be fairly likely to emerge for adaptiveness reasons. O’Brien (2021, §2.4) argues in this direction by suggesting that evolution favors scarcity and antagonism, which correlate with suffering. I propose a different argument according to which suffering is itself *directly* selected for as an unusually adaptive mechanism. Evolution selects the forms of life that best sustain and/or replicate themselves (Darwin [1859] 1964; McGhee 2016) with total disregard for those that it may subjectively affect. One form of life that does this extremely well is an ecosystem that contains sentient living organisms (Klein et al. 2025) that are “guided” away from nonadaptive behaviors (such as not avoiding illnesses, injuries, and predators) by this effective punishment mechanism we call “pain”, which we know can come in many flavors. In particular, there is evidence in favor of concluding that punishments are, regrettably, generally more effective than rewards at “guiding” beings’ actions (see, e.g., Kubanek et al. 2015). Moreover, not getting a reward may create frustration, which is nothing but another form of pain. Meanwhile, avoiding punishments does not seem non-trivially enjoyable. This allows suffering to be even more common. The commonality of suffering in Earth’s biosphere is not a random “glitch” or an unfortunate accident. It is an adaptive feature. Evolution could, in theory, very well only select for other mechanisms that would have a similar role, but suffering sadly happens to be both “simple” enough to emerge naturally and unusually efficient such that it is strongly selected for (over potential other simple mechanisms that would

not effectively symbiose with it)[12]. For this evolutionary reason, even if an anthropogenic off-Earth ecosystem ends up looking nothing like Terran ones, it would still be likely to have given rise to some form of suffering comparable to those on Earth.

Sivula (2022, §4.2) briefly calls for research aimed at determining how life could be spread with no or little suffering involved. However, no one has argued that this is likely to be pursued, let alone successfully. Such a demonstration would have to be backed by very strong evidence to justify non-trivially updating away from the a priori expectation that replicating wildlife would replicate the suffering it contains. This is particularly true in the face of deep uncertainty regarding how the long-term future will unfold and how our actions affect it, a context in which the evidence we can gather usually are hopelessly weak (see, e.g., Greaves 2016; Mogensen 2021; Tarsney 2023; Tarsney et al. 2024, §3). It is not impossible that if humanity attempts to create another biosphere, it will want (and successfully coordinate) to totally address the problem of animal suffering. However, to expect that this will likely be the case is to advance a demanding thesis, one that would require evidential support of a strength commensurate with its ambition—support that is, at present, entirely lacking.

6. Conclusion

I have considered and tentatively rejected what I take to be the most defensible arguments according to which replicating wildlife off-Earth would be in the interests of

[12] E.g., unlike the internal mechanisms sustaining and replicating bacteria and plants which themselves do not involve suffering/sentience (although they greatly benefit from external mechanisms that do involve suffering/sentience such as animals spreading plant seeds being perfect hosts for many bacteria).

the (extraterrestrial) wild animals resulting from such a process. I suggest that the necessary criteria for ethically justifying creating new beings, whatever one may reasonably think these criteria are, are not met when it comes to potential off-Earth wild animal populations.

The above claim is weaker than (although not incompatible with) the idea that there is, in expectation, "more suffering than pleasure" in nature and that this is what decisively matters for whether it is morally permissible to replicate wildlife off-Earth. This stronger and more specific claim has premised the core arguments of *all* those who raised the concern with multiplying wild animal suffering before me, namely, Tomasik (2015, §4, §12), O'Brien (2021),[13] Sivula (2022, §4.2), Horta and Rozas (2024), and Soryl and Sandberg (2025, §4).[14] Therefore, while these authors defend a set of beliefs that support my case, many other sets of assumptions can support it. As §2, §3, and §4 suggest, a large variety of views can get behind the stance that knowingly and actively creating severe animal suffering on a planetary scale cannot be considered benevolent towards the subjects of this suffering. All these arguments against spreading wild ecosystems off-Earth, including mine, interestingly also constitute arguments against spreading wild ecosystems *on Earth* in territories that have been (mostly) deprived of life so far, e.g., areas close to the poles, deserts, and aquatic dead zones.[15] There is

[13] However, while this is far being from central to his overall case, O'Brien (2021, §3.3) briefly argues that inducing "more pleasure than suffering" in expectation may be too low of a bar and suggest that "we have a duty to provide our creations with a reasonable chance of flourishing".
[14] Kovic (2021, §4.3), (Faria 2023, p.183), and O'Brien (2024), while mostly discussing adjacent topics, also make brief cases against replicating wildlife off-Earth building upon some of the aforementioned work. Torres (2018), Vinding (2020, p.249; 2022, p.115), Baumann (2022, p.18), and Moret (2023) do something similar, although even more briefly.
[15] Thanks to Estiva Reus for making me realize this was worth noting.

nothing ethically special about the off-Earth location per se[16]. My focus on this specific case is due to the potential for greater scale and the fact that biological terraforming, directed panspermia, and biosphere creation have been seriously advocated for (see the first paragraph of §1), unlike planting forests in Antarctica or seeding life in dead zones. As suggested in §2 and §3, the ethically significant action is principally that of creating totally new[17] sentient beings and populations (independently from their exact location in the universe).

While I present what I believe to be a strong argument against spreading life off-Earth, all else equal, my case is limited to animal ethics considerations and their intersection with environmental ethics. Centrally, I have not discussed whether the potential upsides of such a project for humanity could outweigh the interests of the wild animals it would cause to exist.[18] However, the burden of proof lies on the thesis according to which it does, and I remain unaware of any argument in this direction that has been defended. The problem of animal suffering has remained largely and unwarrantedly ignored or poorly acknowledged in the literature on replicating wild ecosystems on other celestial bodies.

[16] However, as Oskari Sivula commented on a draft, the off-Earth element may imply higher irreversibility to the extent that humans would have less control over what happens beyond their home planet than on it. This can make the off-Earth location morally relevant for practical reasons.
[17] I here use the term "*totally* new" to imply that the ethics of, e.g., *rewilding* (i.e., of *restoring* wild ecosystems) might have relevant specificities making my argument unadapted to this other context. Whether it is in fact unadapted is beyond the scope of this piece, however.
[18] Sivula (2025) seems to indirectly acknowledge a similar fact of the matter when writing "one could argue that spreading life to the cosmos brings cosmic meaning to people's lives. Thus, it may have non-tangible benefits for humans."

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The author declares no conflicts of interest.

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