

## VALUING ABIOTIC NATURE

### PERSPECTIVES ON TERRAFORMING IN K.S. ROBINSON *MARS TRILOGY*<sup>1</sup>

#### VALORIZANDO A NATUREZA ABIÓTICA

*Perspectivas sobre a terraformação na trilogia de Marte de K.S. Robinson*

#### VALORACIÓN DE LA NATURALEZA ABIÓTICA

*Perspectivas sobre la terraformación en la trilogía Marte de K.S. Robinson*

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Recibido: 28/02/2022

Aprobado: 18/07/2022

### ABSTRACT

In our everyday experience, life, environment, and nature are connected and we tend to confuse the value we assign to them. One way around this issue is to analyze our intuitions on the terraformation of other planets such as Mars. In this way, we are forced to consider whether the original abiotic nature has a value of some kind regardless of its capacity to support ecosystems and life, what kind of value this might be, and what weight it might have when compared with other values. In this contribution, I will draw a map of the possible answers to these questions by analyzing the different perspectives brought forth by some of the main characters in K. S. Robinson's *The Mars Trilogy*. In this way, it will be possible to observe that, while on Earth instrumental and non-instrumental kinds of environmental value generally concur and support each other, in an abiotic landscape, such as that offered (we assume) by Mars, they may conflict.

Keywords: terraforming. environmental value. value of abiotic nature. Kim Stanley Robinson. *The Mars Trilogy*.

### RESUMO

Na nossa experiência cotidiana, a vida, o ambiente e a natureza estão ligados e temos tendência a confundir o valor que lhes atribuímos. Uma forma de contornar esta questão é analisar as nossas intuições sobre a terraformação de outros planetas, tais como Marte. Desta forma, somos forçados a considerar se a natureza abiótica original tem algum tipo de valor independentemente de sua capacidade de suportar ecossistemas e vida, que tipo de valor poderia ser e que peso poderia ter em comparação com outros tipos de valor. Neste artigo, vou traçar um mapa das possíveis respostas a estas questões, analisando as diferentes

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<sup>1</sup> An early draft of this paper was first presented at the Shanghai Jiao Tong University during the conference «Living the New Era. Digital Technologies, Creativity, and Science-Fiction». I would like to thank the attendants, participants, and organizers, in particular Juan Li and Nicola Bruti Liberati. I would also like to thank Berta Diaz and Federico Sanguinetti for some comments on another version of the manuscript.

perspectivas trazidas por algumas das principais personagens de *A Trilogia de Marte* de K. S. Robinson. Desta forma, será possível observar que, enquanto na Terra os tipos de valores ambientais instrumentais e não instrumentais geralmente concorrem e se apoiam mutuamente, numa paisagem abiótica, como a oferecida (assumimos) por Marte, os mesmos podem entrar em conflito.

Palavras-chave: terraformação. valor ambiental. valor da natureza abiótica. Kim Stanley Robinson. *A Trilogia de Marte*.

## RESUMEN

En nuestra experiencia ordinaria, la vida, el medio ambiente y la naturaleza están conectados y tendemos a confundir el valor que les asignamos. Una forma de evitar esta cuestión es analizar nuestras intuiciones sobre la terraformación de otros planetas, como Marte. De este modo, nos vemos obligados a considerar si la naturaleza abiótica original tiene algún tipo de valor independientemente de su capacidad para sustentar ecosistemas y vida, qué tipo de valor puede ser y qué peso puede tener en comparación con otros valores. En esta contribución, dibujaré un mapa de las posibles respuestas a estas preguntas analizando las diferentes perspectivas aportadas por algunos de los personajes principales de la *Trilogía de Marte* de K. S. Robinson. De este modo, será posible observar que, mientras que en la Tierra los tipos instrumentales y no instrumentales de valor ambiental suelen coincidir y apoyarse mutuamente, en un paisaje abiótico, como el que ofrece (suponemos) Marte, ellos pueden entrar en conflicto.

Palabras clave: terraformación. valor ambiental. valor de la naturaleza abiótica. Kim Stanley Robinson. *La Trilogía de Marte*.

## Introduction

Terraforming is the hypothetical transformation of a planet or a satellite to improve its capacity to support life, with Earth as its Platonic ideal. In this way, the ultimate goal of this process of planet engineering is to reshape a planet or a satellite to emulate the functions of Earth's biosphere as much as possible so that it can support in the open the lifeforms typical of our home planet with minimal modifications or differences (Fogg 1995).

Many celestial bodies in the Solar System have been proposed as the subjects for hypothetical terraforming operations. Although what was probably the earliest scientific contribution on the issue has been a proposal to planetary engineer Venus (Sagan 1961), it is on Mars that most of the research is now focused on. This should not come as a surprise since the Red Planet is the celestial body in the solar system whose conditions, as measured by the Earth Similarity Index (Schulze-Makuc et al. 2011), most resemble Earth. Even on Mars, though, terraforming poses highly complex and context-dependent scientific and engineering problems, the solution of which is usually beyond the current knowledge or technological capabilities. This is not to say that Mars terraforming is not seriously discussed in science. Indeed, a part of the scientific community believes that it will be possible to start engineering Mars in the medium or even short term and that it is hence necessary to start discussing not only the scientific and technical aspects of terraforming but also its ethical, social and political aspects (Beech et al. 2021).

Terraforming offers several opportunities for reflection for philosophers. For instance: what does it exactly mean to emulate the functions of the terrestrial biosphere? Given that a perfect replica of Earth is impossible to obtain, when can we properly say to have terraformed a celestial body? What will change in our self-representation as a species when, on terraformed planets, cultures, societies, and even people's bodies will start to diverge from the original Earthly models? Moreover, from a more practical standpoint, what is the ethical status of terraforming? Is it permissible, commendable, or even required—

or should we instead condemn it as morally execrable? Is the eventual conclusion generalizable to any terraforming project? What could be the conditions and criteria for terraforming a planet or a satellite responsibly?

These latter ethical questions require analyzing and unpacking several issues before attempting to formulate a tentative answer for them. A first issue often raised is that terraforming could destroy pre-existing autochthonous forms of life or their traces (McKay & Zubrin 2002). This eventuality, however, would be rare indeed. Nevertheless, since the present best candidate for terraforming is Mars, a planet which, according to some scientists, could present—or could have presented—the theoretical conditions for the development of life as we know it (Schulze-Makuch et al. 2008), the argument is worth to be debated.

From another perspective, the sheer size of the efforts required by terraforming and their underlying ambitions may raise several ethical questions. Given the vastness of the resources required, the complexity of the processes set in motion, and the impossibility of predicting with certainty the outcomes, terraforming is often labeled as a manifestation of hubris, and, hence, as morally condemnable (Sparrow 1999, 2015). However, this argument is often rebutted as uncharitable, because its supporters tend to exaggerate and generalize the risks associated with terraforming and underestimate the value that the knowledge accumulated through research on this topic can have for better environmental management of our planet (Schwartz 2013).

One of the interesting aspects of space ethics is that the situations it explores need to be analyzed in two complementary ways: a first way, concerning the applications of our theories, principles, and moral intuitions to the unusual conditions and scenarios involved in space activities; a second way, concerning the repercussions of these space activities on Earth. In this sense, terraforming, should it become feasible, could lead to a change in the way we value our home planet. The claim that “there is no planet B”, for instance, would immediately lose meaning if Mars, Venus, the Moon, or the poles of Mercury would get the chance to become hospitable environments. This would create a moral hazard and it could push us to act even more recklessly than we are currently doing concerning the climate and the environment of Earth. On the other hand, terraforming research could instead provide us with new opportunities, knowledge, and technologies to solve some of the most insidious challenges that lie ahead: planetary engineering could help us in mitigating the effect of the environmental crisis; a new planet at our disposal could provide us in the long term with a relief valve for demographic pressure. And so on.

In a further sense still, terraforming can be an incredibly rich source of thought experiments to investigate some philosophical nodes that can be hard to disentangle when observed from an Earthly standpoint. Concerning environmental philosophy, for instance, terraforming examples can be used to shed light on: (a) the difference between various kinds of environmental value; (b) the value or values we should attach to abiotic nature.

In our common earthly experience, life, the environment, and nature are intimately connected concepts. Because of this connection, we tend to conflate the values we attach to them, sometimes even to the point of totally losing sight of their difference. In other words, we tend to consider our valuing living beings, the complex system that supports their existence, and naturalness as part of the same experience—or even as the same experience. The conditions posed by terraforming scenarios, instead, make us possible to separate between these different concepts and the values that accompany them. This is particularly important when it comes to analyzing the value to be assigned to abiotic nature. On Earth, abiotic nature is usually an essential component of the environment and, as such, it is intrinsically integrated with life: it is its support and precondition and maintains with life a constant metabolic exchange. For this reason, from our terrestrial perspective, it is hard, if not impossible, to analyze the value per se of abiotic nature (York 1995). Terraforming scenarios ask us instead to imagine the transformation of “pure” abiotic nature (something which is not an environment) into a new landscape capable of hosting life. In this way, we are forced to reflect on whether the original abiotic nature has a

value of some sort independently of its value in supporting ecosystems and life, which kind of value this could be, and how much it would weigh when compared to other kinds of values.

In what remains of this contribution I will try to draw a map of the possible answers to this question, and I will do so by analyzing the different perspectives on terraforming carried out by some of the main characters of Kim Stanley Robinson's *Mars Trilogy*.

### **Perspectives on terraforming in the *Mars Trilogy***

The books composing the *Mars Trilogy* are *Red Mars*, *Green Mars*, and *Blue Mars* (henceforth: *RM*, *GM*, and *BM*, respectively), with each color representing a stage of the terraforming process of the planet: red like the pristine surface on which the settlers land; green like the landscape dominated first by algae and lichens then by plants when the process of ecopoiesis is started; blue like the water that finally fills Mars with oceans, rivers, and lakes. Despite the vast time span involved, most of the recurring characters belong to the “First Hundred”, the early settlers landed on the planet whose life expectancy is incredibly extended following the discovery of anti-aging treatments.

The scientific, social, and political aspects of the Martian colonization constitute essential elements of the plot of the trilogy. It is among the First Hundred that the debate on terraforming Mars is first started and their original perspectives shape much of the politics and values expressed by later settlers and their descendants. Selected from the best scientists and engineers on Earth, the First Hundred become immediately divided over the meaning of their presence on the Red Planet. Some see it just as a unique occasion for engaging in research, without further complications. Others want to experiment with the planet, even if it means to change completely its natural conditions. Others see the mission as an opportunity for social engineering and want to build a radically new society. Others still would content themselves to exploit the extraordinary resources of Mars.

At least nominally, only the first of these course of actions—researching without interfering—would be permitted to them by the Earth’s authorities, because the mission rules are modeled according to those of scientific expeditions carried out in the Antarctic. However, the radical uniqueness of their situation—in terms not only of distance from the terrestrial authorities but also of the harshness of the condition they are exposed to—ends up pushing the settlers to take their destiny into their hands, igniting a debate on the needs to proceed quickly with terraforming Mars.

In this way, two radically distinct visions of the Red Planet come to clash. On the one hand, Mars as the pristine planet—with its natural history as much as old and important as that of Earth, its unique scientific mysteries to be discovered and solved, and its equally unique beauty to be explored and contemplated. On the other hand, Mars as the raw material for creating a new environment—a new home for humanity, and a cradle for the future society of the settlers and their descendants. The first vision of Mars is presented as incompatible with terraforming. The second one sees terraforming as the natural outcome of the expedition. Several arguments are advanced in the trilogy advocating for one or the other of these two positions.

a) **Ann Clayborne.** Opposition to the terraforming plans finds its stubborn champion in the head of the geological expedition, Ann Clayborne. Ann wants to preserve Mars in its pristine form, avoiding every kind of alteration of the natural conditions on the planets even if this actually translate into a severe downsizing of the colonization attempt—as emigration from Earth will be necessarily limited, settlers will have to live into cramped underground environments, and every visit on the surface will expose them to radiations.

The initial argument she uses to defend her position is the possibility of indigenous life existing at the microbial level. Any alteration initiated by the terraforming process would almost certainly destroy this life—something that Ann judges wrong both from a scientific and a moral standpoint. Nevertheless, she does not seem really committed to this argument, advocating it perhaps only for tactical reasons—that

is, because it seems to have the greatest hold on the imagination of people. When her major interlocutor and opponent, the brilliant yet socially awkward physicist Saxifrages “Sax” Russell, points out that it is basically an argument from ignorance—since, while there are no traces of life on the surface, there is no way to prove or disprove a similar result underground—Ann just drops this line of arguing, without dropping, however, her anti-terraforming commitment. This leads to one of the decisive moments in the plot of the whole *Mars Trilogy*: the public debate between Ann and Sax on terraforming. The debate takes place in the main hall of the first settlement on Mars, in the presence of at least half of the First Hundred, and it is filmed and broadcasted on Earth. It becomes a turning point in the history of Mars colonization, as it marks the ideological birth of two of the main political factions of Martian society, the “reds” opposing terraforming and the “green” favoring it.

During the debate, Ann articulates her real arguments against terraforming—those that she will reiterate during much of the trilogy. The first argument is based on the scientific value of a pristine Mars. Terraforming would destroy much of its geological record and other scientific data that could be used to better understand the planet and the solar system, and, for this reason, it should not be started. By making clear the scientific reasons backing her value assumption, Ann also attacks the kind of science proposed by Sax. Terraforming, in her view, is not true science: it can be compared to the actions of a young kid playing with his chemistry set in a basement, only on a planetary scale. It is just a form of scientific narcissism and has nothing to do with proper science, which should be instead interested in studying the planet as it is, with all the evidence regarding its history and the origins of the solar system in place.

Ann then raises two other arguments. The first one is based on the aesthetic value of Mars. Terraforming would destroy the Martian beautiful and pure landscape, and it would do so, again, for shallow reasons. The second one is based on what we could call the “existential” value of the planet—that is, the value coming from its alterity, its difference from ourselves and Earth. Terraforming would destroy this difference, and hence its value, as it would amount to the transformation of another piece of the universe into a mirror image of ourselves. In a previous dialogue Ann had already raised this issue:

We'll all go on and make the place safe. Roads, cities. New sky, new soil. Until it's all some kind of Siberia or Northwest Territories, and Mars will be gone and we'll be here, and we'll wonder why we feel so empty. Why when we look at the land we can never see anything but our own faces (*RM*, p. 190)

By removing radiation, lack of breathable atmosphere, and extremely cold weather we remove from Mars, in Ann’s opinion, something just as important in our life as safety: we remove differences.

b) *Saxifrages Russell*. In the first book of the trilogy, Sax plays the role of the terraforming enthusiast. He secretly starts the terraforming process without waiting for the approval of both the Earth's governments and of his fellow First Hundred. He does not seem to care for the opinions of others if he believes that they do not conform to rationality—to his rationality, and he seems to not genuinely grasp the difference. His mentality and positions will dramatically change during the rest of the trilogy, as he will stubbornly struggle to understand Ann's position and reconcile with her. During the first debate, however, his arguments straightforwardly support terraforming.

For Sax, terraforming has many different values—all of them more important than the value offered by a sterile planet like Mars when the first settlers arrive. First thing, terraforming, according to Sax, is a grandiose scientific experiment, with unique and unrepeatable opportunities for knowledge and technological improvement. Moreover, terraforming would enhance Mars’ beauty, by enriching its landscape with lakes, forests, and glaciers, and by adding life, “the most beautiful system at all”. Third, it would offer the opportunity for propagating conscious life, which Sax considers the most valuable thing at all—a claim that he justifies with the fact that it is only consciousness that provides the universe with meaning. “The lack of life here”, he states,

and the lack of any finding in fifty years of the Seti program, indicates that life is rare, and intelligent life even rarer. And yet the whole meaning of the universe, its beauty, is contained in the consciousness of intelligent life. We are the consciousness of the universe, and our job is to spread around, to go look at

things, to live everywhere we can. It's too dangerous to keep the consciousness of the universe on only one planet, it could be wiped out (*RM*, p. 213)

These words will mark the turning point in the debate, now increasingly in favor of Sax. Ann, however, will be not convinced by the argument. She will reiterate her idea that we need alterity—something completely different from us—to not feel empty, and she will claim that our being the consciousness of the universe does not authorize us with transforming it into our mirror image. Yet she will also feel defeated by Sax's argument—a feeling shared by the presents and by the public watching the broadcasted debate.

c) **Hiroko Ai.** A third perspective on terraforming and the value of Mars is offered by the First Hundred's lead biologist, Hiroko Ai. For Hiroko, Mars is an opportunity to spread life to another planet beyond Earth: life in its broadest possible sense, at all biological levels. This biocentric impulse arises in Hiroko from the belief in a life force—which, following XII century mystic and scientist Hildegarde von Bingen, she calls *viriditas*—that permeates the universe.

A constant pressure, pushing toward pattern. A tendency in matter to evolve into ever more complex forms. It's a kind of pattern gravity, a holy greening power we call *viriditas*, and it is the driving force in the cosmos (*GM*, p. 20-1).

Hiroko's beliefs translate into a favorable attitude toward terraforming if this is understood first and foremost as the construction of a complex life-support system, whose goal is not so much to ensure the survival of the human species as such, but that of the system itself. Similarly, Hiroko's approach to terraforming is, unlike Sax's, strongly holistic and will gradually turn mystical and quasi-religious.

d) **Other positions.** While Ann, Sax, and Hiroko provide the three main intellectual perspectives on terraforming, at the extreme of the debate other two positions can be identified—two opposite positions. The first one is claimed by the members of the political faction opposing terraforming—the “Reds”. According to this position, Mars is to be respected and left as it is due to its intrinsic value. Many Reds will try to enforce this position by any means, including the use of terrorism, and their most extreme faction will even go so far as to wage civil war on Mars.

On the opposite spectrum, some characters in the *Mars Trilogy* support terraforming to advance their agendas. This latter position is endorsed by very different people, with very different sets of values: those of rapacious capitalism (Phyllis Boyle, geologist and businesswoman), of liberal and green capitalism (William Fort, CEO of Praxis, a “progressive” and “enlightened” transnational corporation), and even of revolutionary socialism and anarchism (Arkady Bogdanov, mechanical engineer and revolutionary).

Phyllis Boyle and William Fort support terraforming for its economic value, albeit understood from different perspectives. Arkady Bogdanov, on the other hand, wants to terraform Mars because it is the only way to emancipate the colonists from Earth and build a society on new foundations. Besides differences in their ultimate reasons, what these positions share is a more or less explicit adherence to anthropocentrism, which inevitably overshadows any consideration of the value of Mars in its pristine state.

## Valuing abiotic nature

The different values attributed to Mars can be organized through two axes (see **Table 1**).

The first axis (instrumental/non-instrumental) is related to *utility*: whether the attributed value is pursued in view of some sort of utility, or, if it is instead related to something like “beauty” or “knowledge” which, while it can *indirectly* provide people with some sort of utility, it is primarily pursued for its own sake.

The second axis (anthropocentric/non-anthropocentric) is related instead to the *locus* of the attributed value: more specifically, whether the value is human-focused or it is not.

<b>Table 1: Value of Mars</b>		
	<i>Non-anthropocentric</i>	<i>Anthropocentric</i>
<i>Non-instrumental</i>	<i>Intrinsic value</i> (“Reds”)	<i>Scientific, aesthetic, and existential value</i> (Ann)
<i>Instrumental</i>	<i>Life-support</i> (Hiroko)	<i>Intelligent life-support</i> (Sax); <i>Mars as a new opportunity</i> (Phyllis, William, Arkady)

The dividing line between values supporting or opposing the terraforming of Mars lies on the instrumental/non-instrumental axis. This should not come as a surprise. If Mars is considered valuable beyond its “utility-value”, then terraforming might not be an option. Otherwise, if its value is only in its use, terraforming seems the most reasonable choice, as this utility-value can be realized only by transforming it in an Earth-like planet.

Interestingly, there can be instead values for and against terraforming in every sector demarcated by the anthropocentric/non-anthropocentric axis. This is because the “utility” created by terraforming does not necessarily have to benefit our species, and some non-instrumental values such as beauty or knowledge, while not advocating for terraforming, remain nevertheless human values.

Each cell in **Table 1** will now be briefly analyzed.

a) ***Intrinsic value***. Intrinsic value is a complex concept that in environmental ethics has been used to describe different possible kinds of value attributed to nature (O’Neill 1992; Jamieson 2008). Here it is defined through two characteristics: it is a form of value that, at the same time, is not directly useful to anyone (it is not-instrumental), and it is not focused on our species (it is not-anthropocentric).

Many environmental theories incorporate intrinsic value. Ecocentric theories, for instance, consider large holistic natural complexes such as ecosystems to be intrinsically valuable. This, however, does not authorize us to conclude that the abiotic nature embedded in these systems could be equally intrinsically valuable. In ecocentric theories, wholes usually take precedence over components, and it is, therefore, reasonable to think that abiotic nature, being only a part of a complex system, can only receive instrumental value and perhaps even no value at all if separated from an ecosystem. For this reason, some authors believe that a Mars populated by life forms—even if allochthonous ones—would have a greater value than a pristine yet sterile planet, and they are ready to support terraforming on these grounds (McKay & Marinova 2001). Other authors, instead, have taken the opposite path, and have provided arguments to extend the ecocentric perspective to assign intrinsic value to abiotic nature independently of its being part of an ecosystem (Rolston 1986, Lee 1994). The possibility of assigning intrinsic value to the “mineral” dimension of nature has also been considered, albeit somewhat cursorily, within the debate on the concept of geodiversity (Gray 2005).

In the specific case of Mars, assigning intrinsic value to the planet means valuing it independently from its specific qualities—its possible beauty, its history, its capacity to become a new home for our species, etc. Attributions of intrinsic value are usually decisive when it comes to weight different reasons in a balancing—although not a rule, considerations grounded in intrinsic value usually trumps considerations based on non-intrinsic forms of value. This is well represented in the *Mars Trilogy* by the self-righteousness with which many “Reds” operate.

The main problem with intrinsic value attributions is that they are difficult to justify for holistic entities, to whom attributes traditionally considered morally relevant such as sentience, conscience, etc., cannot be ascribed. In these contexts, the attribution of intrinsic value risks appearing without solid rational justification, as something mystical or overtly religious. This aspect is again well represented in the *Mars Trilogy*. Throughout the story, many characters attribute to Ann a position based on intrinsic value. This includes many “Reds” who look at her for leadership and inspiration, as well as Sax himself, who, at one point, believe to have finally grasped her position, identifying it as Martian version of Aldo Leopold’s Land Ethics—rather a strange identification, given the absence of an autochthonous biotic community on the Red Planet. Ann, however, does not support an intrinsic value theory of Mars. When the narration takes place from her point of view, we learn that she feels uncomfortable when facing arguments based on intrinsic value. She finds this concept to have little comprehensibility, and judges it (and those inclined to adopt it) too near to mysticism and religion. While she never openly disagrees with those “Reds” who espouse intrinsic value theories—probably to not weaken the front opposing terraforming—she finds their stance incompatible with sound reason and science.

b) *Scientific, aesthetic and existential values*. Nature can be a source of significant experiences: scientific curiosity and knowledge, aesthetic beauty, reverence for otherness, and diversity. These kinds of experiences, while having a disinterested character—they do not provide us with something directly useful—are nevertheless human experiences, and as such the value that we attach to them can be defined, at the same time, anthropocentric yet non-instrumental.

From this perspective, it can perhaps be argued that a terraformed Mars might be a better source of meaningful experiences for people than a bare, uninhabitable planet. After all, a terraformed Mars would be more accessible to people, richer in possibilities for experiences—hosting life forms—and ultimately more resonant with our evolutionary baggage. The terraforming process itself could be a source of significant experiences, especially in science. This aspect is captured by Sax when he uses just such arguments to defend his terraforming projects. Moreover, throughout the narrative arc, the same Sax will never cease to marvel at the scientific and aesthetic developments of the process. The problem with these attributions of value, however, is that an important if not necessary aspect of this kind of experience is missing: authenticity. One of the characteristics that make nature-related experiences—especially aesthetic ones—unique is authenticity, that is, the fact that our experience of nature is precisely an experience of nature, of something that is not under our direct control or that we have shaped in a significant way.

The significant experiences that can be linked to a terraformed Mars or to the terraforming process itself are hence not the same as those that can be associated with a Mars in its original condition, and they are not necessarily better. In front of a non-expert eye, the Martian landscape may appear repetitive and inanimate, but its aesthetic value may instead manifest itself in all of its beauty to someone capable of recognizing and appreciating the “mineral” regularities hidden in its apparent monotony (McMahon 2016). Deciding at this point which of the two aesthetic perspectives is to be preferred is no longer just a matter of taste, but of safeguarding diversity: because whereas we already have a terrestrial landscape here on our planet, we do not have another Martian landscape besides the original one.

This may explain Ann's insistence throughout the trilogy's narrative arc on the loss of aesthetic and scientific value caused by the terraforming of Mars, but also on the loss of this element of radical otherness. “You don’t know Mars” is the cold remark she repeats to Sax every time he tries to convince her that a terraformed Mars could be more beautiful than the planet in its original state. For Ann, the question is also existential. Elaborating from her perspective, we could say that terraforming Mars would be in a sense like transforming it into what Marc Augé has called a “non-lieu” (Augé 1992), that is, an anonymous place devoid of history and possibility for contingency. This could certainly serve our immediate interests, but ultimately it will leave us unhappy—a most obvious and inevitable effect of the homogenization brought about by terraforming.



c) **Life support.** Nature can be an environment: it can support life. This can be valuable both from biocentric and ecocentric perspectives. Despite this similar starting point, however, the two perspectives differ when it comes to the concept of the kind of life that is valuable. For biocentric theories, the kind of life that is valuable is individual life. To be alive is the crucial feature for being morally considerable, and biocentrism, for this reason, holds that each individual existence is valuable per se. For ecocentric theories, on the other hand, the kind of life that is valuable is the biotic community. The individual existences that made up this community participate in its value, but, at the same time, they are only valuable because they are parts of it. At their simplest, biocentric theories may have trouble ordering conflicts between the interests of different living creatures. This problem does not plague ecocentric theories, for which the individual interest that deserves to prevail is always the one that contributes most to the community interest. In this way, however, ecocentric theories, at least in their simplest version, can be accused of not respecting individuals, and sacrificing them, if necessary, to the community.

Despite these differences, both biocentric and ecocentric views share an instrumental view of abiotic nature. Inside the frame of these theories, the only ethically relevant element that can be linked to abiotic nature is its life-support capacity—and it is indifferent here whether we understand life in a holistic or individual sense. For this reason, except for opportunity value, no other value can be attached to sterile abiotic nature.

It should be noted that while the life-support value attached to abiotic nature is instrumental, it is nevertheless not anthropocentric. Its focus is not restricted to human life but embraces all kinds of other species—including non-animal species. It is an instrumental, yet non-anthropocentric value.

This is essentially the kind of value that Hiroko's perspective assigns to Mars. The Red Planet, for her, is only the stage in which a new chapter in the story of the expansion of life takes place. What is intrinsically valued in this view is the spreading and evolution of life. Mars—and all abiotic nature in general—as value only has the empty canvas on which to carry out this process—as the substrate and the raw material for a new creation.

d) **Intelligent life support.** Intelligent life is considered valuable for multiple reasons, as it is connected with the possibility of experiencing numerous cognitive and sensory states to which we attach particular importance. For some people, disseminating, or even simply defending, the existence of this intelligent life can be a value, leading to the ethical imperative to defend and promote the existence of our species. In the long term, this means developing the capacity for our species to abandon the Solar System. As a necessary step on the long quest for this goal, colonization of other planets in our home system will be requested—and Mars is probably the best place to start.

In this perspective, abiotic nature is valued instrumentally—by virtue of its capacity to host life—and in an anthropocentric way—because the kind of life we consider morally relevant is intelligent life, which coincides, at least within our present reach and knowledge, with our species.

This is the position endorsed by Sax, and it is justified, in his opinion, by the fact that only conscious intelligence gives meaning to the universe, and it is its apex of complexity, being the least entropic entity it contains. This perspective, of course, supports terraforming: nevertheless, as Sax learns during the *Mars Trilogy*, it does not support it necessarily as the reckless and hubristic process he argued for at the beginning.

e) **Mars as a source of opportunity.** In this category are collected various considerations of instrumental and anthropocentric nature that, while adhering to the previous idea that the value of abiotic nature resides in its capacity—actual or potential—to benefit human life, interpret this latter expression not as “to benefit the existence of the species”, but as “to benefit people”. Abiotic nature, in this way, is seen as valuable for the opportunities it can grant to individuals. The identity of these individuals and the nature of the benefit is determined by how this opportunity value is specified. The *Mars Trilogy* offers several examples of values in this regard. Both Phyllis Boyle and William Fort, for instance, seem to value Mars for the economic opportunities it offers. Concerning the different ways in which they

conceive the economic exploitation of the planet, it is interesting to note that the character more in favor of fully terraforming Mars—William Fort—is the one more attentive to its sustainable development, precisely because he sees in the creation of a whole new world a more durable and profitable venture than the rapacious stripping of its raw resources. The views of Arkady Bogdanov offer another example of this kind of this opportunity value attached to Mars. For him, the Red Planet is an opportunity to build from scratch a new society with utopian leanings.

## Conclusions

Eventually, in the books of the trilogy, Mars undergoes terraforming, becoming something unique and new compared to Earth, and, at the same time, something that inevitably ends up resembling our home planet at the expense of the original pristine landscape. Politically and socially, terraforming is not described as a peaceful and uncontroversial process. It undergoes acceleration and decelerations, and passes through revolutions and civil wars, until the original Mars, excluding its considerable heights where the atmosphere is still too thin, is transformed. This brutal fact, however, does not provide an answer to the question of whether it was right or wrong to terraform the Red planet in the first stance.

Some characters mature and modify their starting views over the two centuries-long narrative arc. Sax is perhaps the character that undergoes the most spectacular change. In his struggle to make sense of Ann's ideas, he will come to understand the beauty and scientific importance of Mars, and he will regret the decision to recklessly start the terraforming process. This will not make him abandon his support for the ultimate goals of terraforming—as he will remain faithful to his main argument, the necessity to spread conscious intelligent life into the cosmos. He will nevertheless try to find a synthesis between his and Ann's positions, rejecting “invasive” terraforming methods, and advocating the establishment of large “wild” areas in the highest parts of the planet, limiting the creation of an atmosphere and the spreading of life to the plains and lowest altitudes.

Very specific positions on environmental ethics have been attributed to Robinson's work in the *Mars Trilogy*—for instance, it has been said that it is an attempt of drawing the contours of a Martian Land Ethics, in analogy with the “earthly” Land Ethic of Aldo Leopold (Otto 2003). As is often the case, it is difficult to rigidly classify an author's vision, especially if it is spread across something less than two thousand pages, and voiced through several characters with diverging agendas. However, there is no doubt that the plot of the trilogy seems to indicate the necessity of a synthesis of some sort between the different perspectives advocated by its main characters. In other words, from the *Mars Trilogy* seems to emerge a claim that a responsible terraforming process can be achieved by trying to bring together the best elements of the main perspectives on the value of Mars. The very ending of the last book would seem to indicate this solution, ideally bringing together the characters representing each of the three main conceptions (if we accept that the Asian woman seen surfing on the beach in the last pages of *BM* may be or perhaps, more realistically, may symbolize, Hiroko). How to arrive, in the concrete, at such a synthesis, however, is far from obvious, given the divergence between the different values at stake. On this point, the novels seem to insist that a synthesis cannot be obtained in advance through theoretical compromise, but must be built along a tortured path through the accidents of history.

Returning to our main point—using the case of the terraforming of Mars as a hypothetical scenario to untangle some questions inherent to environmental philosophy—Robinson's *Mars Trilogy* has the merit of drawing a detailed map of the major arguments that can be deployed for or against engineering a planet to transform it into an Earth-like body, providing us in this way with important insights into how value can be assigned to abiotic nature.

In particular, imagining a scenario such as the terraformation of Mars allows us to understand how what is often conflated together and called environmental value can refer to very different realities: living individuals of other species besides ours, the environment, understood as the set of elements that interact with living individuals allowing their survival and reproduction, and nature, understood instead as the other respect to the transformative action of our species—that is, according to its meaning as the opposite

of “artificial”. Giving value to one of these aspects can often mean giving value to the other aspects, but it is not necessarily always the case: in fact, sometimes the ethical demands connected with these different concepts can conflict.

This becomes evident if we analyze the values that can be attached to Mars—and by extension to all abiotic nature. The instrumental values push us to transform this abiotic nature into an environment, modifying its original naturalness in the process. Non-instrumental values, on the other hand, push us to preserve the original natural element, even at the expense of the possibility of propagating human and non-human life. In the terrestrial context, this conflict does not usually arise since the abiotic nature is almost invariably tied to the environment where living creatures thrive, and, therefore, there is no contrast between its conservation and that of the ecosystems that depend on it. In the case of non-terrestrial nature, this is not the case: and every present and future terraforming ethic will have to start from this contrast to construct its proposal.

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