



RESEARCH ARTICLE

Astrobioethical reflections on humanity and its consideration as multi- and interplanetary

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Abstract

We discuss in the context of astrobiology three aspects of the possible evolution of humanity. In addition, from astrobioethics -the study of the moral implications in astrobiology- we ask whether it is necessary to develop new concepts. Thus, it is concluded that we have already started our transition towards an interplanetary humanity; that our actions in the face of the discovery of extraterrestrial life will depend on the context in which we find ourselves; and that it is important to develop new and updated concepts for the scenarios to be faced by the eventual evolution of humanity in space.

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The new science of astrobiology concerned with four different aspects of life: the origin of life in the universe, its cosmic evolution, its distribution in the universe and its destiny (Dick and Strick, 2004). We are focusing on two of these aspects, namely, the second – the evolution of life in the universe – and the third, its distribution, especially when we restrict our enquiries to the evolution of humans. In other words, we should allow astrobiology to include also the implications of the expansion of humanity in the cosmos as presented in the NASA Astrobiology Strategy (Hays, 2015). We wish to study the ethical implications of research in this context. For this purpose, such reflection on astrobioethics is essential (Martínez-Frías, 2016; Owe, 2019; Persson, 2021; Lo Sapio, 2022), as discussed in a previous paper (Chon-Torres, 2018),

Being so, understanding the possibility that humanity may eventually have a greater presence in the universe, makes us ask ourselves some questions that do not necessarily have a definitive answer. After all, ethics as a branch of philosophy generates doubts, questions, problems, which are updated

depending on the culture, the time, the position that is defended, among others. This being the case, we present three aspects to reflect upon from astrobioethics -the study of the moral implications in astrobiology- that are totally legitimate, such as the fact of really considering ourselves as a multi- and interplanetary species; what should we do in the face of the discovery of other forms of life; and whether it is necessary to develop new concepts around the new problems that astrobioethics forces upon us?

Can we think of ourselves as a multiplanetary species?

The ideal of being a multiplanetary species represents a conceptual difficulty. If we were to truly become a species different from the present one, we would be genetically different from what we are now. Aldhebiani (2018) outlines the biological characteristics that define a species, including the resemblance between individuals within a species, distinct differences between related species, a definable geographic area that corresponds to environmental conditions, and reduced reproductive success when mating with other species for sexually reproducing taxa. If we understand by multiplanetary species the same humanity that lives on Earth, then it is more convenient to speak of multiplanetary humanity, and the same is true for an interplanetary humanity. Therefore, the problem lies in the use of the term 'species', because that would mean that if there is a multiplanetary species and another interplanetary species, the biological characteristics mentioned above would be different.

Musk (2017) said that our fate as a species is between staying on Earth forever and becoming extinct, or becoming a multiplanetary species, and that the latter option is the one that would be the most desirable. However, a multi-planetary humanity could represent more of an ethical or social ideal than a fact. Only in a scenario where humanity has been able to colonize different planetary environments, and with enough time for considerable genetic differences to emerge, could one speak of being a multiplanetary species, going beyond being *Homo sapiens sapiens* (Chon-Torres and Murga-Moreno, 2021). Therefore, it makes more sense if the reference is made in terms of a moral ideal of humanity, visualizing itself from the possibility of an improvement in its condition.

What should the ideal of multiplanetary humanity consist of?

First of all, let's define what it means to be multi- and interplanetary. According to Chon-Torres and Murga-Moreno (2021) being multiplanetary would mean the ability of humanity to settle in different planetary environments, while interplanetary would be the ability of humanity to travel between worlds, without necessarily involving the development of settlements on the planets to be explored. In this context, an ideal scenario of multiplanetary it should be perhaps about the ethical principles shared by the human community residing in the different settlements, or colonies that will be developed in the future. For example, the relationships that we can establish between human settlements from different planetary environments. Every planetary environment involving a specific human population or scenario possesses its unique peculiarities. These peculiarities are key in shaping the manner in which these communities interact with their counterparts from other planets. Yet, this should not be understood as an imposition on the way to manage territories at the multiplanetary level. Here, the extraterrestrials would be us according to the place of origin of each human group. In a multiplanetary context the concept of extraterrestrial life will have to change, since we will be talking about people and/or animals who have been born outside the Earth. Therefore, the appropriate reference for life that originates on Earth is that they are biogeocentric in nature, a term that will be developed in more detail later.

Considering that humanity in space is likely to have a way of administering itself to something more akin to tyranny-since perforce the hostility of space, or other planets forces us to do so-(Cockell, 2018), the limits of what should be done and what is moral must be posed in this multiplanetary community. It would not be good to end up in a dystopia because of the moral degeneration derived from the conditions of habitability to which we will be forced. After all, despite having better technology for terraforming and colonizing worlds, it is no guarantee of improved morals.

Let us consider Mars for this reflection, as it is the planet that Elon Musk refers to when he talks about humanity as a multi-planetary species (Musk, 2017), and it is the same one that Cockell posits as an environment that, in the way the colony is managed, might look more like a prison-dwelling (Cockell, 2018). If we reflect on it at a philosophical level, we should keep in mind that the concepts and ideas we acquire in our life are given by our interaction with the environment. The human mind is not an element separated from the environment, but it is developing and responding according to the conditions in which it lives. We are not saying that the product of this interaction necessarily reflects that it is right or wrong. What we are saying is that all the knowledge we have is conditioned by the ontological aspect, which for humanity is to be a relational being with its environment. Anthropologist Bartra (2014) calls this the *exocerebrum*. That is, a person does not develop his or her personality and characteristics in isolation, but thanks to the environment, he or she is allowed to form an identity. Thus, let us imagine the environment of an incipient Martian colony, where the conditions of habitability determine a future Martian culture.

If we assume as true the idea that a future colony on Mars would be more like a tyrannical regime, then a Martian culture might see as normal some ethical aspects that would not be tolerated on Earth. For example, some elements that may be similar between how a prison functions and how planetary stations might function are: isolation; strong hierarchies to maintain order; camaraderie and interdependence among members of the population; diversity of cultures and knowledge; awareness of the challenges of such a population (Cockell *et al.*, 2021).

Clearly, this does not assume that these conditions will be this way forever; eventually, in an optimistic scenario, terraforming could at some point allow for greater freedom. However, we are talking in the long term, and the way of interacting in a Martian culture will have markedly different ways from those of other colonies, or of Earth itself, with other regulations and idiosyncrasies. And this way of managing human colonies would not be limited to Mars, but may extend even further, especially if we consider that ‘There are aspects of the space environment that are predictably tyrannous and they are despotic in a way which evades specific definitions of liberty’ (Cockell *et al.*, 2021, p. 24). Under this scenario, the vulnerability of actually becoming not only a tyrannical-like regime form -by necessity-, but also falling into corrupt management, makes the notion of multiplanetary moral community stronger. This situation is not entirely foreign to us. Here on Earth during the measures taken to fight the pandemic, some nations have distorted the primary purpose of caring for people to one of controlling people, especially in authoritarian-leaning governments.

In the ‘short’ term, the first multiplanetary community would not necessarily guarantee the presence, or idea of a united humanity, but of different ‘humanities’ scattered in the Solar System, some of which may not represent the ideal of democracy. In any case, we have a situation far from being uniform. However, an optimistic vision about this diversity could have been given by Stapledon (1948), since he said that this should be one of the objectives of humanity, since it will allow new ways of understanding the universe, not only on a scientific level, but also on a human and spiritual level.

Regarding the interplanetary possibility: is it possible to conceive ourselves as an interplanetary humanity even if we haven’t learned to live together in peace on Earth?

Having observed that it is complicated to consider ourselves as a truly multi-planetary species, we should examine whether we can at least conceive of ourselves as an interplanetary species. As we live today, with the struggle of political and economic powers, it does not seem that we will overcome our differences by the time we manage to visit and colonize other worlds. Therefore, it is not even a prerequisite for humanity to manage itself as a true planetary species in order to then be conceived as interplanetary.

We live in a globalized and interconnected world. However, even with challenges as the COVID-19 pandemics, we have not learned to coexist in a more peaceful way, and even new wars continue to be generated. For this reason, it might be more probable to assume that our history in space will not be

exempt from such scenarios either. In an environment where each country looks after its own space interests, it could be a matter of time before political disputes arise over the right to settle in certain places on the Moon or Mars. This situation is reminiscent of Thomas Hobbes' idea that man is a wolf to man, *homo homini lupus*, were updated to the space level, living in constant mistrust and trying to overcome the other in order not to be overcome first.

Even so, the process of becoming an interplanetary humanity depends more on the technological condition in which we find ourselves. Thus, it is more appropriate to think that we are at the beginning of a technological progress called interplanetary. The technology that is currently being assessed seeks to finally develop a future beyond Earth. Currently, with NASA's Artemis Project, for example, the aim is to have a permanent presence on the Moon, similar to that of the International Space Station. Interplanetary is part of the technological process involved in taking humanity to other planetary and non-planetary environments.

A future scenario of humanity in space is that despite having a kind of Interplanetary United Nations, there is still some division inside each country. That is, humanity will not see itself as a planetary species unified. We will not be a great planetary nation, and explorations into space will be driven by the interests of each country or, more likely, bloc of countries (and private entities like SpaceX, also). For example, one set of countries has certain interests in conducting research on the Moon, while other countries also have the same interests, but just because they have them does not mean that they will be permanently united. Interests in space exploration would not seem to determine the rapprochement between nations at the political level, as that responds to other motives. This is related to another scenario that is also now a fact, the militarization of space.

Although official documents such as the Outer Space Treaty from 1967 indicate that space should be used only for peaceful purposes and research (United Nations, 2002), in practice the outcome may be different. It is likely that some areas of the Moon will be militarized in the near future, under the guise of being a deterrent. With the increasing demand for resources on Earth, some countries and private actors may see the Moon as a potential source of resources, tensions and conflicts that could eventually lead to militarization; If a country has a significant presence on the Moon, it may view this as a matter of national security and could deploy military forces to protect its interests, this could lead to the militarization of the Moon.

Essentially, it is likely that military activities and operations will occur in space because the technology used for things like telecommunications is very important, and nations will want to protect and defend this infrastructure. This means that defensive and offensive tools will be necessary, so that if there is a conflict between countries, they can disable certain strategic points of their rivals that are located in space (Bernat, 2019). It does not seem to be the case that this trend will change in the near future, so an interplanetary humanity will still experience this tension between nations.

Regarding the latter, perhaps we will not have overcome the so-called 'planetary iron age' (Morin, 2009). The concept of the 'planetary iron age,' as described by Edgar Morin, refers to the current state of humanity. Despite being aware of each other's existence and living on a single planet, we still behave in ways that create division and conflict rather than unity. Morin argues that we have not yet learned how to truly coexist with each other. If we apply this concept to a future scenario in which humans settle on other planets, it is likely that we will continue to struggle with these same issues. The same tendencies towards division and conflict that exist on Earth may persist on other planets as well. It is unclear whether we will ever be able to fully overcome these challenges, but we can strive to live with them in the best way possible. Throughout human history, we have faced numerous obstacles and challenges, and we have often found ways to adapt and overcome them. This resilience and adaptability may be necessary as we continue to expand our presence beyond Earth.

The above has been a reflection on the consideration of humanity as multi or interplanetary. However, in the journey ahead, there is the possibility of encountering other life forms. Beyond whether humanity can really overcome its differences as a result of these discoveries, it remains to examine what should be done in the event of any direct contact with life forms outside of Earth.

After finding life on other worlds, a question is forced upon us: do they have rights?

The question is relevant because it implies our limitation of action towards these life forms as a humanity multi- or interplanetary. To understand what limitation will be necessary, we should realize that new questions will be forced upon ethicists. These include whether living beings on other worlds, or microorganisms have rights. Fortunately, this is not an altogether foreign discussion, divorced from mainstream moral philosophy, which is based on questions that ethicists consider to be relevant for human beings on Earth. We argue, following (Persson, 2013), that ethical concepts may be universal, not constrained to humans alone. Ethics has been extended to – animals – non-human species on Earth, by Peter Singer, even though, he does not reason in terms of rights (Singer, 1993).

Under the assumption of finding life on other worlds, the concepts developed for non-human species (terrestrial animals) serve as a convenient starting point: We extend astrobioethics to encompass the more general problem of finding a sound moral basis for relations with those outside our own species: not just to include animal standing, a topic that has been extensively discussed (as mentioned above).

But more relevant still are the following two questions: Do they have rights and why should we act morally? How far should we extend our ethical codes with such unprecedented questions in moral philosophy? These questions are suggested by astrobiology: planetary protection, terraforming and, especially with respect to non-human species, including microorganisms. But we should further keep in mind that if a planet is already inhabited, do we have the right to occupy and terraform it?

A first example concerning care that a multicellular organism deserves

We generally accept the Principle of Equality as a proper ethical basis for relations with other human beings and extend it to animals as well. In other words, we are aware that the Principle of Equality is also a proper ethical basis for the more restricted question of human-nonhuman relations on Earth. This is a natural extension of the Theory of Justice, whose principles are chosen behind a veil of ignorance. This ensures that no one is advantaged or disadvantaged by the outcome of natural chance (Rawls, 1972). In the case of astrobioethical considerations, we are aware of our ignorance of the eventual confrontation with extraterrestrial life. Giving a future confrontation, we should keep in mind the related Principle of Equality raising the Rawls consideration to this novel situation presented to us by the distribution of life in the universe, which is the aspect of astrobiology referred to at the beginning of this work.

In the case of non-intelligent complex life forms there would be no major problem, the necessary care should be taken not only because they represent an interest in research, but also because they have value in themselves. Rights-based ethics would be an appropriate first approach for dealing with extraterrestrial life, in analogy with cases that have been discussed for non-voluntary decisions.

Our search for other manifestations of the phenomenon of life that astrobiology encourages us to search with the appropriate instrumentation, ranges from microbial evolution in the Solar System to the evolution of intelligence in worlds elsewhere in our galaxy that we may eventually be revealed by means of the SETI Project (Drake and Sobel, 1992).

On the assumption that complex life forms –and with the capacity to feel pain– are confirmed, they should be treated with an empathy similar to that of terrestrial animals. In the words of Cockell (2005a, 2005b; Cockell *et al.*, 2021) from a teloeopathic point of view, expanding our moral consideration towards extraterrestrial life forms is necessary. In the case of non-intelligent complex life forms there would be no major problem, the necessary care should be taken not only because they represent an interest in research, but also because they have value in themselves.

A second example concerning microorganisms

The possibility of discussing Europa's habitability was raised very early (Reynolds *et al.*, 1983), and was renewed soon after the arrival of the Galileo mission to the Jovian system. A theoretical paper inspired by the possibilities of future exploration of Europa, suggested that beyond the Galileo mission

itself, novel instrumentation was conceivable, even though it had not been included in the payload of Galileo: the proposed future instrumentation was a submersible called a ‘hydrobot’ that would have been coupled to an ice-breaker, called a ‘cryobot’ (Horvath *et al.*, 1997). A relevant question arising from the theoretical paper of Horvath *et al.*, was whether the cryobot was to be driven with nuclear energy in order to penetrate the European icy surface more efficiently. The question of considering nuclear-powered cryobots has been raised in the context of solar system exploration, especially for Mars (Elliott *et al.*, 2003). The levels of fission power and related harmful radiation are normally small for humans.

A study was conducted in order to investigate whether a surface fission power system was applicable for landed missions. In the course of their study, it became clear that the application of such a power system was possible for a wide range of missions for solar system exploration (Ulamec *et al.*, 2007). Their study was concerned with fission electrical power of the order of a few kilowatts (kW), abbreviated as kWe. This level is needed for payloads that are feasible, since the alternative of radioisotope power systems becomes unmanageable, being too massive and expensive. These proposals illustrate the need to take care while probing other worlds where there are potential biotopes, as in the case of the European ocean.

In this scenario, microbial life forms may also be of teloempathic interest, but being simpler forms, their ability to feel pain - assuming this - would be left out.

Need for a new astrobioethical terminology

Teloempathy

Since we are facing new scenarios, in the form of thought experiments, we are faced with the need to employ new concepts to better develop the subject matter in the ethics of astrobiology. One of these concepts is that of teloempathy. This concept, coined by Cockell (2005b), refers to the moral consideration we can have towards non-intelligent extraterrestrial life forms. Considering that it is in our hands to protect them, under the idea of teloempathy it would be part of our ethical duty to help them at least not to be annihilated.

Biogeocentrism

Another relevant term for astrobioethics is ‘biogeocentrism’, a concept, critically analysed in a recent book (Chela-Flores, 2011, p. 291) – This is actually not the standard view, some believe it, but most scientists and philosophers apparently do not) – Such divergent opinions deserve special attention. It reflects a tendency observed in some contemporary scientists and philosophers, according to which life is only likely to have occurred on Earth, an opinion maintained by Darwinists, paleobiologists and molecular biologists: Ernest Mayr made the radical assumption that life in other worlds has an ‘improbability of astronomical dimensions’ (Mayr, 1995). Simon Conway-Morris writes: ‘*To reiterate life may be a universal principle, but we can still be alone*’ (Conway-Morris, 2003, p. 328). Finally, Jacques Monod summarized his faith in biogeocentrism in the following terms: *The present structure of the biosphere certainly does not exclude the possibility that the decisive event occurred only once.* (Monod, 1972).

But philosophers, both modern and ancient, have also taken part in the discussion for and against biogeocentrism. Indeed, we should go further back in time to come to grips with the larger philosophical issues of a second Genesis (Chela-Flores, 2009): Western philosophy began raising the question of the intelligibility of nature, as far back as with the first Greek philosophers, who were called physiccists (Russell, 1991), but in the background of the pioneering ideas of the plurality of worlds stated by the Greek atomists: Democritus, c. 460 – c. 370 BC, as reported by Hippolitus, and the Epicurian school, including Simplicius and Metodorus of Kios, Aristotle, himself did not elaborate on the ideas of his predecessors (Bertola, 2001). In spite of Aristotle’s seminal influence, the idea of the plurality of

worlds was not abandoned. It was carried on in the Roman world by the philosopher and poet Lucretius (ca 98-54 AC) in *De Rerum Natura* (**On the Nature of Things**), he did not exclude the possibility of other inhabited Earths, cf., vv. 1023–1047 (Bertola, 1999). Yet, as mentioned above, among modern philosophers and scientists, including Darwinists, traces of biogeocentrism still persevere, two and a half millennia after the birth of Democritus.

Conclusions

1. The idea of a multi- or interplanetary humanity may evoke the notion of a united humanity. However, as has been discussed above, this is not necessarily the case. In fact, it is possible that we may end up establishing ourselves outside of the Earth with divisions due to the struggle of interests and political grudges arising in the countries of origin. Can we think of ourselves as a multi- and interplanetary humanity? Yes, we can, but with important ethical and political limitations that will determine the future of us in space. In addition, it is more than likely that even sharing other planetary environments, we have not finished feeling like a planetary humanity in relation to Earth, and this can be extrapolated to the different bases and settlements that are to be erected in the Solar System, so we could speak of different ‘humanities’ in the sense of political and economic interests.
2. With respect to the scenario in which we find complex extraterrestrial and microbial life forms, the protocol to be used will have differences. That is to say, it will not be the same to act if it is confirmed that the life form found has the capacity to feel or not. However, this does not mean that the fact that it does not feel confers an inferior quality (in relation to their moral status), but, as on Earth, our approach and ways of dealing with it will differ. Now, the final way of dealing with any of these life forms, microbial, or otherwise, will depend on the interests of the human group or nations in charge, and also depend on the interests of the organisms in question. If at present a particular country -even a company- has the capacity to study extraterrestrial life forms -in the hypothetical case that it is discovered- and in the process of studying it, it endangers or even damages it, there is no international law or regulation that sanctions what is being done.
3. It is important to develop an appropriate terminology to be able to dialogue and discuss issues related to morality and astrobiology, i.e. astrobioethical terminology. Our actions are guided by the concepts we use, and in order to deal appropriately with new scenarios, it is important to update those concepts. Talk of telompathy, biogeocentrism and even astrobiocentrism, are just some of the words that are beginning to be integrated into the vocabulary of astrobiology, and of any discussion that relates to the reflection of life in the universe, and/or our expansion in it.

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