Short communication

Planetary Protection for Mars: Time for Reconsideration

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Abstract: In this manuscript I discuss the ethics of the protection of hypothetical organisms on Mars in terms of upcoming manned space missions and subsequent colonization.

Keywords: space, bioethics, Mars

Introduction: Back in 2013 it looked very rational to hold the following neutral, neither strictly anthropocentric nor biocentric position: "The assumption about the existence of life on Mars should not be the reason to stop the red planet colonization, but precautions should be taken to minimize risks of introducing the Earth life on Mars, and to prevent Mars contamination" [1]. After all, prospects of the existence of Mars life were generally not thought to be very high – it was either considered to be entirely in past tense, or currently existing underground.

Three important things, however, have happened during the last two and a half years. First, it was the discovery of hydrated salts and possibly liquid water in present times on the recurring slope lineae on Mars [2]. This increased the chance of Mars being inhabited even today, only in shallow depths, close to the surface.

Second, people have started speaking openly against near-term manned missions to Mars on the basis of planetary protection.

In 2015 the Planetary Society (an organization publicly involved in space advocacy) suggested a roadmap for Mars called "orbit first" [3]. The roadmap envisions sending astronauts near the Moon throughout 2020s, to Mars orbit and Phobos in 2033 and to the surface of Mars in 2039. Thus the last step (a human mission to the surface of Mars) would happen after more

than two decades. The planetary geologist and space blogger for the Planetary Society Emily Lakdawalla stated [4] that she supports this "orbit first" strategy, and that human beings should stay away from the Mars surface for a while, until robots conduct experiments concerning Mars water and life. Lakdawalla says that humans would contaminate Mars and after that it will be harder to answer the question whether we are alone in the Universe or not. Keith Cowing, an astrobiologist and a space journalist, has sharply criticized Lakdawalla's position. He has stated that the Planetary Society does not want humans on Mars, that the Society wants to stretch a human program to the surface of Mars further in time due to the belief that human bodies do not belong there [5].

Third, the time of interplanetary manned spaceflight is approaching, and the colonization of Mars is next. Private entrepreneur Elon Musk would like to send humans to Mars as soon as 2024 [6]. This is in a stark contrast with what both NASA and the Planetary Society envision (mid- to late 30s). Although 2024 is a date that yet remains to be seen if it will be met, the private space industry has developed very fast in the last few years.

Because of these events in the past two years and a half, it is time to quickly rethink the ethics and policies of planetary protection in terms of human space exploration and subsequent colonization.

Discussion: Solar System planets and their satellites, with the exception of Earth, are harsh places and inhospitable for humans. Even Mars is more extreme than the most extreme places on Earth. Earth's biological organisms cannot just be emplaced and expected to thrive on the present Martian surface [7]. But could hypothetical life on Mars, which may be different from Earth life, exist there and be able not only to survive, but also grow and reproduce? We do not know yet. In terms of the planetary protection of such hypothetical life, we could still create artificial habitats on Mars and these are not necessary to be physically close to the places considered with a potential for life, such as the already mentioned recurring slope lineae [2], the features on Mars that have been connected with the action of liquid water. If these features host hypothetical local Martian microorganisms, we could keep human habitats far from these places with the intention to protect them.

A task colonists on Mars could do in the more distant future is not just living there in protected habitats, but actually converting the planet and making it suitable for Earth's life. This is a process called terraformation. But if the idea of terraformation ever comes to fruition, we will be changing the whole conditions of the planet. Plus, we will introduce the Martian surface to Earth organisms, especially photosynthetic species (like cyanobacteria and algae) which will be able to convert the already present carbon dioxide into oxygen. Do we have the right to do so, even at the cost of endangering hypothetical local organisms? Here we must remind the opinion of the prominent visionary Carl Sagan, one of the co-founders of The Planetary Society: "If there is life, then I believe we should do nothing to disturb that life. Mars then, belongs to the Martians, even if they are microbes" [8].

The opinion of Carl Sagan, however, is one of several. As McKay has explained, except for the opinion that Mars should be left alone to the Martians, there are also opinions to alter Mars to a point its own biota could become a global biological system that controls the biogeochemical cycles of the planet, or to take samples of the whole hypothetical biodiversity on Mars and store them in biobanks, before spreading Earth life forms to the planet [9]. As an author of this manuscript, in the light of recent opposition to human spaceflight to Mars, I have recently adopted more anthropocentric rather than biocentric position [10] for the following reasons: Firstly, anthropocentrism poses no fundamental moral objection to terraforming Mars. Secondly, space colonization activities would benefit humanity. And thirdly, even if the argument is raised that Mars life should be studied first before the planet is exploited, on anthropocentric grounds such objection doesn't assign intrinsic worth to the extraterrestrial environment, because for the anthropocentrist it's the humanity that counts [11].

Thus my opinion differs from the biocentric opinions of Sagan and McKay (the later thinks terraforming is not fair concerning indigenous Martian life). I still think we should try to protect foreign life whenever possible, however the value of the human life is supreme. I firmly believe that we should first do everything to ensure survival of the humans, as they are currently the only known intelligent species in the Universe. Colonization of space and later terraformation will ensure our survival in long terms and should have higher priority. Preservation, while still very important in order to study the foreign life, should come second. Thus, some associated risks with colonization and terraformation of Mars concerning its hypothetical organisms are acceptable.

Conclusions: Due to the fact the time of manned interplanetary travel is approaching because of the fast private space industry's development, I state that scientists should reignite the debate about planetary protection and possible lessening of the requirements as soon as possible. I worry that current overprotection trends could stall the human exploration of Mars and subsequent colonization for years to come.

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