

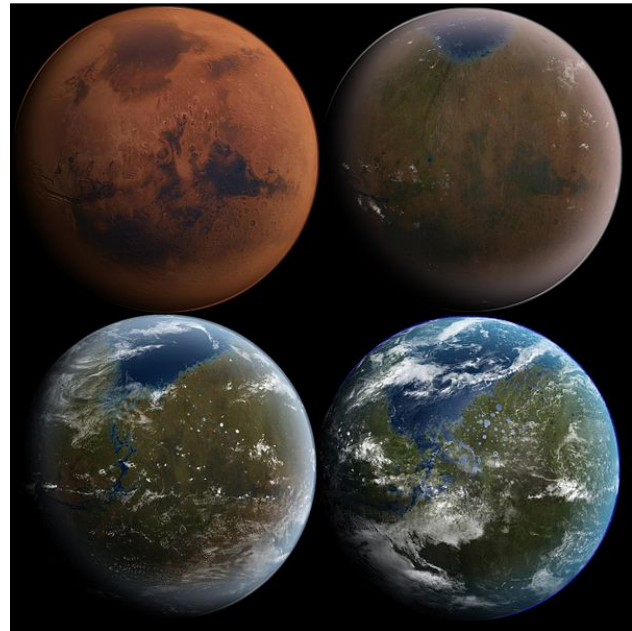
Name: _____ Class: _____

Should We Terraform Mars?

By Paul Scott Anderson
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Forming colonies on Mars has been the subject of books and movies for a long while now, but how possible is it? In this opinion piece, Paul Scott Anderson discusses the process by which Mars could be altered to be inhabitable by humans. Anderson ponders whether humans should inhabit a new planet just because they can. As you read, take notes on the risks that Anderson identifies with terraforming Mars.

[1] As we continue to explore farther out into our solar system and beyond, the question of habitation or colonization¹ inevitably comes up. Manned bases on the Moon or Mars for example, have long been a dream of many. There is a natural desire to explore as far as we can go, and also to extend humanity's presence on a permanent or at least semi-permanent basis. In order to do this, however, it is necessary to adapt to different extreme environments. On the Moon for example, a colony must be self-sustaining and protect its inhabitants from the airless, harsh environment outside.



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Mars, though, is different. While future bases could adapt to the Martian environment as well, there is also the possibility of modifying the surrounding environment instead of just co-existing with it. This is the process of terraforming — essentially trying to tinker with Mars' atmosphere and environment to make it more Earth-like. Although still a long ways off technologically, terraforming the Red Planet is seen as a future possibility. Perhaps the bigger question is, should we?

One of the main issues is whether Mars has any indigenous life or not — how does this affect the question of colonization or terraforming?

1. **Colonization** (*noun*): the process of taking control over a place

If Mars does have any kind of biosphere,² it should be preserved as much as possible. We still don't know yet if any such biosphere exists, but the possibility, which has only increased based on recent discoveries, must be taken into account. Such a precious discovery, which could teach us immensely about how life arose on both worlds, should be completely off-limits. Small colonies might be fine, but living on Mars should not be at the expense of any native habitats, if they exist. The most likely place to find life on Mars is underground. If the surface is truly as sterile and barren as it seems to be, then colonies there shouldn't be too much of a problem. It has also been suggested that Martian caves would make ideal human habitats, serving as natural protection from the harsh conditions on the surface. True, but if it turned out that something else was already taking up residence in them, then we should leave them alone. If Mars is home to any indigenous life, then terraforming should be a non-issue.

- [5] What if Mars is lifeless? Even if no life otherwise exists there, that pristine³ and unique alien environment, so far barely scratched by humans, needs to be preserved as is as much as possible. We've already done too much damage here on our own planet. By studying Mars and other planets and moons in their current natural state, we can learn so much about their history and also learn more about our own world in that context. We should appreciate the differences in and variety of worlds instead of just transforming them to suit our own ambitions.

There is also the more current but related problem of contamination. There has been a long-standing protocol, via the 1967 Outer Space Treaty, to have all spacecraft going to the Moon or Mars sterilized as much as possible. If bacteria from Earth made it to the Martian surface and survived, it would complicate the search for life there; if a lander or rover was to later identify living organisms in the soil, it might be difficult to determine whether they were just contamination or true native life forms. From both a scientific and ethical perspective, it would seem prudent⁴ to try to protect Mars as much as we can from earthly intruders. This applies equally whether Mars is already inhabited or not. Fortunately, for almost any kind of bacteria or other microorganisms from Earth, it would be very difficult if not impossible to survive on the Martian surface, never mind flourish. The risk of planet-wide contamination is very negligible,⁵ but it is still better to take strict preventive measures than to play with chance.

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2. the parts of the land, sea, and atmosphere in which organisms are able to live
 3. **Pristine (adjective):** in its original condition
 4. **Prudent (adjective):** acting with or showing care for the future
 5. **Negligible (adjective):** so small it's not worth considering

Text-Dependent Questions

Directions: For the following questions, choose the best answer or respond in complete sentences.

1. PART A: What is the meaning of the word “indigenous” as it is used in paragraph 4?
 - A. strong and vigorous
 - B. possessing higher mental capacity
 - C. threatened with extinction
 - D. originating in a particular place

2. PART B: Which phrase from paragraph 4 clarifies the meaning of “indigenous?”
 - A. “small colonies”
 - B. “native habitats”
 - C. “natural protection”
 - D. “harsh conditions”

3. PART A: What is the central argument contained within paragraph 6?
 - A. The danger of bacterial contamination from Earth could make it difficult to determine whether there is native life on Mars.
 - B. The 1967 Outer Space Treaty guarantees that Mars should not be terraformed in any way.
 - C. It is almost impossible that any life could survive on the surface of Mars.
 - D. Landers and rovers are routinely being sent to Mars in order to investigate if there is any native life on the surface of Mars.

4. PART B: Which excerpt from paragraph 6 directly undermines that argument?
 - A. “it would seem prudent to try to protect Mars as much as we can.”
 - B. “it would complicate the search for life there”
 - C. “it would be very difficult if not impossible to survive on the Martian surface.”
 - D. “all spacecraft going to the Moon or Mars sterilized as much as possible.”

5. PART A: How does the author develop the primary claim of the article in paragraph 5?
 - A. He allows for an important exception to the general applicability of the argument.
 - B. He affirms the validity of the argument despite information that might seem to challenge it.
 - C. He suggests that future research will reveal how critical the argument is for humanity’s survival.
 - D. He criticizes the way many people in the past have ignored the persuasiveness of the argument.

6. PART B: In which quotation does the author make an argument using the same technique as in Part A?
- A. "There is a natural desire to explore as far as we can go, and also to extend humanity's presence on a permanent or at least semi-permanent basis. In order to do this, however, it is necessary to adapt to different extreme environments." (Paragraph 1)
 - B. "Although still a long ways off technologically, terraforming the Red Planet is seen as a future possibility. Perhaps the bigger question is, should we?" (Paragraph 2)
 - C. "It has also been suggested that Martian caves would make ideal human habitats, serving as natural protection from the harsh conditions on the surface. True, but if it turned out that something else was already taking up residence in them, then we should leave them alone." (Paragraph 4)
 - D. "If bacteria from Earth made it to the Martian surface and survived, it would complicate the search for life there; if a lander or rover was to later identify living organisms in the soil, it might be difficult to determine whether they were just contamination or true native life forms. From both a scientific and ethical perspective, it would seem prudent to try to protect Mars as much as we can from earthly intruders." (Paragraph 6)

Discussion Questions

Directions: *Brainstorm your answers to the following questions in the space provided. Be prepared to share your original ideas in a class discussion.*

1. Do you agree with the author's beliefs that it is too risky to terraform another planet? Why or why not?
2. How does this text explore the relationship between humans and nature? In what ways do humans attempt to control nature? Do you think they are successful in this? Why or why not? Cite examples from the text, your own experience, and other literature, art, or history in your answer.
3. The author believes that observing the natural state of other planets can teach us more about our own: why do you think this is? Do you think humans can learn anything from terraforming other planets? Why or why not? Cite examples from the text, your own experience, and other literature, art, or history in your answer.
4. How could the development of terraforming technology be both beneficial to humans and potentially dangerous to other life forms? Do you think terraforming could pose any risks to humans? Cite examples from the text, your own experience, and other literature, art, or history in your answer.