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### To Colonize or Not to Colonize: The Mars Dilemma

Ever since space exploration began with Earth orbital and moon missions, people have dreamed of establishing colonies on other worlds. The most likely candidate put forth by the many scientists and researchers has been the planet Mars. It is a planet very much like Earth and likely has all the building blocks to support a future colony of humans. However, the questions of colonization do not end with *can* we do it, they also include arguments of *should* we do it. In this essay, an exploration of both sides of this question will be undertaken. This investigation will include such areas as the logistical, financial, moral and ethical arguments for and against colonization of other worlds by the human race. To enable this examination, Mars will be used as the platform for discussion. While colonization of Mars is theoretically possible, we must consider all of the consequences of human colonization instead of launching ourselves blindly onto this course of action.

There have been many theoretical studies of the consequences and the promise of human colonization of other worlds. There have also been flights of fancy brought to us by science fiction writers that portray the future of man intermingling with life on other planets and establishing colonies throughout the known galaxy. However, to quote a line from one of science fiction's great sagas of recent history, *Star Trek VI: The Undiscovered Country*, "Just because we can do a thing does not necessarily mean that we must do that thing." Somewhere in between the two extremes of ability and moral imperative lies the reality of human colonization

of Mars, a topic which has been the focus of many studies and continues to hold the planet's collective interest.

Beginning with the scientific argument of whether humans should attempt to transplant a copy of Earth's ecosystem to Mars, Frank B. Golley first discusses the mechanical methods of reproduction of an Earth-like system on Mars. In his opinion, there are many obstacles to overcome before any colonization of the Red Planet can commence (Golley 3). Golley states that neither the physical scientists-engineers nor the biological-ecological scientists who have been involved in the process of creating a viable ecosystem have yet considered the human equation in figuring out how to build an ecosystem on Mars. This consideration shows that at the current state of scientific research, investigators are, as of yet, unready to introduce the human element into the complex computations regarding whether the development of an ecosystem capable of sustaining human life on Mars is attainable. This obstacle is a significant impediment to moving forward with any plans for the future colonization of Mars by humans from Earth.

However, according to Golley, others like social scientists, humanists, and novelists have considered the human aspect of space colonization. The human element with all of its social processes and emotional reactions seem to Golley to be incompatible with the "confined, homogeneous, and highly controlled space environment, even on a large space colony" as compared to the relatively free environment humans experience on Earth (4). Golley also postulates that the minuscule controls necessary to regulate all the functions of an ecosystem on Mars, from the molecule to the man, is so Draconian that it would stifle all the "adventure of space travel" (4).

From a practical point of view, colonization of Mars will require three primary consumables, according to Michael Collins, air, water, and food (7). Concerning the element without which human life cannot survive for long, water, Collins noted that three sources exist on Mars that we could theoretically use. These are the permafrost layer, the polar ice caps, and the atmosphere (Collins 7). Collins explains that of all three sources, the atmosphere is the least likely to produce any sustainable amount of water because of the process involved in extracting it. He also explains that the permafrost layer and the polar ice caps hold their own logistical challenges that would have to be overcome to make them viable sources of water (Collins 7). The permafrost layer would be difficult to extract and to separate potable water from the briny substance likely to remain after thawed. The polar ice caps present an issue of distance from any colony established on Mars which would have to be near or at the equator (Collins 7). This considerable distance would make them practically inaccessible. Once the water was procured, oxygen could be manufactured by the process of electrolysis or passing an electrical current through the water to separate the hydrogen and oxygen atoms releasing breathable air (Collins 7). Also, water could be used inside enclosed greenhouses to grow food. Collins was unaware of whether the Martian soil had enough phosphorus to sustain animal or plant life, but the other elements found in the soil seem well-suited for agriculture to begin.

Collins also explores some other aspects of a continuing settlement on Mars such as shelter and mobility. He opines that because of the intense ultraviolet and other radiations bombarding the Martian surface, dwellings will initially have to be constructed with thick soil roofs, be partially underground, or be located in caves or other areas that offer protection from radiation (Collins 8). These measures will be necessary until the atmosphere can be adequately thickened with oxygen and other gases to prevent these dangerous elements from threatening the

lives of the colonists. Collins also pointed out that to satisfy the need of humans to explore, vehicles of some sort would have to be available for mobility purposes (8). At least at first, colonists would be limited to where they could venture in spacesuits until suitable modes of transportation could be developed. Although many of the issues that Collins identified are within the realm of existing science, it will still involve overcoming other significant obstacles on the way to this end.

One who is firmly against the colonization of Mars is instructor of Philosophy at Saint Paul College, Ian Stoner. In his article, “Humans Should Not Colonize Mars,” Stoner examines the prevailing reasoning put forth by others of why we should colonize the Red Planet and gives his opinions and insights for why this would not be a good idea for humanity and offers workable alternative solutions to these reasons. Stoner begins with a series of supportive statements for Mars colonization and then counters the arguments with reasoning that refutes these statements. He lists five reasons for colonization including exploiting the natural resources of Mars, fulfilling the human pioneer spirit, securing new opportunities for experiments in living, as a backup for Earth, and learning the answers to significant scientific questions (Stoner 10-12). In all five of these examples, Stoner refutes the stated reason either with philosophical, ethical, or moral arguments and offers alternatives to exploiting the Martian environment. His arguments are cogent, logical, and stand up to the scrutiny of science.

David Warmflash, an astrobiologist and science writer, offers another alternative to colonizing Mars in his article “Forget Mars. Here’s Where We Should Build Our First Off-World Colonies.” His solutions consist of colonizing the Moon, building a free-standing colony in space utilizing Earth-moon Lagrangian points, or using Venus (Warmflash 17). With all his suggestions for alternatives to colonizing Mars, Warmflash emphasized the overwhelming travel

distance to Mars as a major stumbling block to effective and cost-efficient colonization of the Red Planet (17-18). However, he also pointed out that colonies on the Moon or a free-floating platform in space would carry with them their own problems, most specifically the problem of establishing and maintaining a gravity suitable for human life (Warmflash 19). Our bodies have evolved over millennia to function in Earth's environment and gravity and introducing them to an alien environment would likely have side-effects like muscle atrophy, the malfunctioning of cardiovascular systems, and most importantly to the survival of any off-world colony, whether the manageability of procreation, pregnancy, and birth are possible (Warmflash 19).

Finally, Warmflash stated that he is not against the further scientific exploration of Mars and believes that this portion of man's exploration should continue at full speed (20). He also stated that because there is a lot to be learned from studying this planet, scientific investigation of Mars could unlock some of the mysteries that man has been searching for an answer to since almost the beginning of time (Warmflash 20). However, Warmflash's stance on Mars as a colonization destination is firmly against the notion until the human race discovers a faster method of space propulsion than is currently in use. His support of near-Earth alternatives like the Moon, space colonies, and Venus are more cost-effective and logistically much more logical for current technologies to tackle.

To sum up, the four articles quoted in this essay provided many different views and opinions on the subject of human colonization within our galaxy. Some were for the idea and tried to find solutions to the problems humans currently face with the establishment of a colony on the Red Planet. Others were solidly against the idea on philosophical, ethical, and moral grounds, while others see a better alternative in resources closer to home. In all these ideas and solutions there was a fervent desire to help the human race to expand their horizons in the field

of science and the area of human adventure and pioneering spirit. However, we, as a species, must consider all the pros and cons of colonization of Mars before ever making concrete plans for beginning this new adventure. While theoretically, the possibility of establishing a human colony on Mars is within our reach, there are still significant obstacles and barriers to making the Red Planet ready to receive her new guests, as well as preparing ourselves for the rigors of becoming pioneers in space as our ancestors became pioneers of the New World. This writer holds onto the hope that someday off-world colonies will help us deal with the Earth-bound problems of overpopulation, waste of natural resources, and growing concerns about climate change to preserve for future generations the existence of humanity.

Works Cited

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