Life on Mars

Student's Name:

Institutional Affiliation:

Course:

Date:

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Have you ever wondered if there is life beyond planet Earth? The idea of colonization and the establishment of different life forms on another planet is a phenomenon that continually gains importance in the politics of countries such as the United States. The establishment of human, animal, plant, and microbial life on Mars is one of the fascinations that seeks to provide new avenues to ease the challenges of overpopulation on Earth that constraints resources. Scientific fields of astrobiology and astrophysics analyze Mars' habitability, that is, its abilities to support all life forms, and ecological balance for similarly thriving of all organisms as Earth, and reduce the pressures of climatic change on Earth. Various researches identify factors necessary to sustain life on Mars, increasing controversies, general interest from the population, and extensive studies by organizations such as NASA and SpaceX. Science should increase its focus on Mars as a possible life-sustaining planet because evidence gathered so far indicates characteristics and life forms such as water and microbial life that infer sustainability of human life and possible ecological set up to offset the pressures of climatic change currently placed on Earth.

Mars as a Planet

According to NASA Science (2020), Mars is the fourth planet from the sun, terrestrial, and the smallest of the so far discovered planets in Astrology. Also called the red planet, Mars has a revolution of 687 days, and its rotation is slightly above the Earth's 24 hours. Markedly, evidence from orbits and rovers indicate that Mars is cold, dusty, and has a thin atmosphere that points to its support for life billions of years ago. These characteristics puzzle scientists in establishing possible life forms to expand human and organisms' life to the planet. The analysis of Mars reviews the iron characteristics in soil that result in the red color of soil and atmosphere and the resultant effects of these characteristics in making Mars habitable to life forms (NASA Science, 2020).

In a similar fashion to Earth, Mars has seasons that span the 687 days of the planet's revolution. Further evidence from astrological research indicates that Mars has polar ice caps, extinct volcanoes, and canyons. Notably, these factors make scientists probe these features' reactivation in the future and the probability of such events contributing to the re-development of life-sustaining conditions (NASA Science, 2020). Moreover, these factors probe the origin of life forms on Mars billions of years ago and the processes that led to the deactivation and extinction of features, such as volcanoes and extinction of possible life forms and water masses. The information provides a roadmap for NASA and other international space programs to focus on Mars as the next home of humans and the ecologies that support their existence (NASA Science, 2020).

The nature of mars allows for its exploration using robots and artificial objects, such as orbiters. Notably, Mars' position away from the sun provides cooler temperatures that allow for the investigation of its features using Mars rovers and orbiters (NASA Science, 2020). In particular, different rovers, such as NASA rovers, Curiosity Rover, and the latest, Perseverance rover, satisfy scientists' conditions that allow their sending to Mars to collect pictures that provide a glimpse of humans' next home (NASA Science, 2020). Moreover, countries develop spacecraft programs, such as India and ESA programs that orbit around Mars. These efforts help collect evidence of aqueous environments, warm conditions, and other features that can support Earth's ecological systems.

Habitable Planet Conditions

A habitable environment refers to an ecological setup that can sustain life's different life and natural processes. One of the main characteristics of a habitable environment is the availability of optimum temperature that influences the anabolic and catabolic reactions of metabolism (National Geographic, 2020). Extremely high or low temperatures are unsustainable for habitation, with optimal temperatures varying between -15^{0}C and 11^{0}C. Conversely, the presence and sufficiency of energy are intricate to supporting life because it avails food and converts between its different forms to sustain life and natural processes. An analysis of Mars' conditions in terms of energy and temperature indicates the need to collect energy further to determine its cold temperatures and optimal energy levels to sustain life forms (Murayama & Dohm, 2015).

A habitable environment must also have sufficient water that can dissolve and transport chemicals and support ecosystems. In particular, the availability of optimal water rates in an environment provides a vehicle for the sustenance of life because it catalyzes life reactions and processes (Murayama & Dohm, 2015). Besides, an environment must have available sources of nutrients to become habitable to support the development, growth, and maintenance of living organisms. The volcanic and geophysical processes of an environment must also have the capacity to replenish nutrients through the release and intake of carbon (Murayama & Dohm, 2015). As such, Mars comes under review to determine if it supports any form of life, based on its water capacities, geophysical processes, and availability of nutrients.

The atmospheric dynamics of a particular environment also affects its habitability. The atmosphere is responsible for trapping heat to warm the planet, prevent harmful radiation, and provide chemical balance (Murayama & Dohm, 2015). An optimal thickness of the atmosphere is responsible for providing optimal temperature and environmental factors witnessed in Earth's

100 units of the atmospheric thickness (National Geographic, 2020). The analysis of Mars and the collection of evidence need to reviews processes for the provision of atmospheric conduciveness. The assessment needs to assess the conditions that make Mars differ from Earth and the changes in atmospheric conditions that guarantee its possibility to be habitable.

Presence of Water on Mars's Surface

Since space technology development, scientists have encountered puzzles studying water's nature in terrestrial environments aside from Earth (Des Marais, 2010). In particular, scientists encounter significant controversy about the availability of flowing water on Mars. Markedly, early rovers, landers, and orbiters, such as Mariner nine, Vikings one, and two captured images of dry river beds, provided evidence in the 1970s about possible water flow Mar's surface in the past (Greenspon, 2019). However, present analyses of the availability of water flow on Mars' surface because of the nature of rocks point to the availability of rivers that allow for sedimentation to form rocks. For instance, the Curiosity Rover, which landed on Mars in 2012, has identified and captured images of slabs of rocks interweaving gavel and shiny material that disappears upon breakage of the rocks, strengthening possible evidence of water flow on Mars' surface (Voosen, 2017).

The last decade has witnessed improvements in strategies and efforts from multiple countries that present more evidence on water flow possibilities on Mars' surface (Voosen, 2017). Notably, different rovers, landers, and orbiters, such as the Perseverance rover, MARSIS investigators, MRO orbiter, and ESA orbiter, have found multiple pieces of evidence of underground water pockets and subsurface lakes (Redd, 2018). In particular, MARSIS investigation has identified layers of ice deep within the surface of Mars' south pole that occurs after a more than one-mile-deep layer of dust. Besides, investigations by the MRO and ESA orbiter and confirmations by the Perseverance rover, curiosity rover, and ESA orbiter through sample analysis of Mars (SAM) technology indicate salty water presence on the surface of Mars (Gross, 2014). These rovers and orbiters take high-resolution images of dark streams, called Recurring Slope Lineae (RSL). Further evidence through robotic investigation reveals that RSLs appear and indicate water flow on steep and warm slopes of Mars' surface and has a seasonal pattern of occurrence, indicating a possibility of habitable Mars by humans and other organisms (Redd, 2018).

Presence of Microbial Life on Mars's Surface

Life forms on Mars also take different trajectories in the scientific world by identifying microbes (Voosen, 2017). In particular, scientists argue that evidence of primitive and less-complex organisms, such as bacteria on Mars, implies the planet's ability to host life. The main significant achievement in the collection of evidence for the existence of microbial life occurred in 1996. In retrospect, a meteorite called ALH84001 found in Antarctica and identified to be from Mars provided an opportunity to study the fossil components (Nola, 2017). The study and fossilization of the meteorites revealed the presence of bacterial-like forms. However, the meteorite's chemical analysis reveals that fossil material on the meteorite results from volcanism and not life. Despite the challenges in mapping and tracing life forms from the meteorite, the presence of organic forms on the meteorite from Mars, similar to Earth, concludes with a possibility for the evolution of life forms to adapt to Mars' conditions (Voosen, 2017).

The scientific world also has a window into evidence of life forms of microbes on Mars after collecting the Nakhla meteorite. Notably, the meteorite's fossil analysis revealed Nano-bacterial life forms, but this was also disproved. Since the advent of space exploration and technology, no significant evidence from Mars indicates microbial life or other organisms (Nola, 2017). The criteria for the approving meteorite and rock-based evidence assumes that the globules of rock from meteorites contain traces of polycyclic aromatic hydrocarbons released by decaying matter (American Museum of Natural History, 2020). Besides, scientific analysis bases on the evidence of magnetite and iron sulfide collected from meteorites from Mars that reflect metabolic processes conserved to bacteria. Lastly, scientists argue that the worm-like forms that cover meteorites from Mars resemble fossil bacteria; thus, forming controversial evidence of microbial life on the Red Planet (American Museum of Natural History, 2020).

Benefits of Mars' Exploration and Occupancy on Climate

The habitation of Mars by human life will result in significant changes, either positive or negative, to the climate conditions of Earth, Mars, and the universe in general. In particular, the identification of suitable conditions and provision of livable situations on Mars will result in a decrease in the population of the Earth (Lamm, 2019). Notably, the Earth current reaps the negative consequences of congestion in increased pollution of the atmosphere by producing increased carbon levels. The colonization and subsequent occupation of Mars present a challenge for humans to start fresh by forming policies that will provide a cleaner and fresher climate for human habitation (Lamm, 2019). Besides, satellite images from Mars and its components promise land of an abundance of minerals and rocks that provide a tremendous human art source. Mars' soil also contains high iron levels, and evidence suggests the capability to support plant growth with limited carbon output (The Ohio State University, 2020). Thus, humans will have an option to review the climatic options that will create an environmentally friendly world to offset the negative effects of Earth's current pollution rate.

Future Plans for Mars' Occupancy

The current efforts and plans for the occupancy of Mars by humans and other life forms provide insights into the dreams and aspirations of NASA and its stakeholders. Markedly, the introduction of Earth-like activities on Mars is a project that NASA targets to achieve in the next few decades. NASA's efforts are evident in the financial, scientific, and research implications behind the setting up the international space station and sending of Mars rovers and lands to the Red Planet, including Perseverance rover, MRO, and the Viking series of rovers (NASA Science, 2020). NASA's efforts also find replication and support throughout the world and in the United States, with key figures and companies, such as Elon Musk’s SpaceX, contributing to Mars research. Media stations also focus interest on the possibilities of NASA’s expeditions through regular reporting and capturing these in movies (Locke, 2020). Lastly, advancements in technology to cover sample transport from Mars will increase the chance of understanding and occupying the climate (The Ohio State University, 2020).

Recommendations for Mars Exploration

NASA and related teams' efforts in gathering evidence for the occupation of Mars by humans and other life forms require an assessment from different perspectives to provide chances for improvement. First, the current space exploration team performs independently with different segments, such as India, European Space Agency, NASA, and others. Rather than compete for being the first to colonize Mars, space agencies need to combine efforts, resources, and knowledge to fasten the discovery process. Second, space agencies need to broaden the scope of focus in their discovery efforts by recruiting people from other fields, such as history, geology, and entrepreneurship (American Museum of Natural History, 2020). Such a move will help interlink activities and clues besides providing finances and motivation for further exploration of Mars. Lastly, space agencies need to develop technologies for sample transportation from Mars to determine intricate characteristics from the rocks, soil, and other details (Voosen, 2017).

Conclusion

In conclusion, NASA and other space agencies' current efforts in collecting evidence from Mars prove positive in determining conditions suitable for humans and organisms' habitation, climate preservation, and the ecological balance of a new planet. The sending of Mars rovers, landers, and space orbiters provides insights into the water, microbial, and geophysical features of the planet that explain humans' progress on human and life form adaptability to Mars. Thus, space agencies must adapt, improve, and collaborate to explore Mars further to increase the probability of human and life occupancy of Mars and offset current climatic pressures on Earth.

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