Paper ID: 83963
oral
student

35th IAA SYMPOSIUM ON SPACE AND SOCIETY (E5)
Space Architecture: Habitats, Habitability, and Bases (1)

Author: Ms. Monika Brandić Lipińska
Newcastle University, United Kingdom

Prof. Martyn Dade-Robertson
Northumbria University, United Kingdom
Dr. Meng Zhang
Northumbria University, United Kingdom
Dr. Magdalini Theodoridou
Newcastle University, United Kingdom
Prof. Lynn Rothschild
NASA Ames Research Center, United States

HABITAT CONSTRUCTION WITHIN BIOREGENERATIVE SYSTEMS

Abstract

Constructing on Mars presents unique challenges due to its distance from Earth and the Sun, including harsh environmental conditions and limited access to resources and energy. To address these challenges, an approach involving biological materials, particularly mycelium, is proposed. The research is dedicated to advancing the development of mycelium-based structural components tailored for resource-limited extraterrestrial environments, emphasizing the efficient utilization of local materials.

Given the limited resources on Mars, the utilization of local materials and the establishment of bioregenerative closed-loop life support systems are essential for sustainable habitat development. Bacteria, fungi, and greenhouse plants can be pivotal in generating crucial resources, serving various purposes like nutrient sources, water purification, oxygen generation, and processing waste into energy. However, sustaining biological life on Mars is challenging due to resource scarcity and the harsh environment. The production of organic matter is resource-intensive and competes with human needs for energy, water, oxygen, and nutrients. Consequently, any organic matter becomes a highly valuable resource, demanding careful consideration in its utilization.

The paper addresses the need for a holistic approach, proposing the integration of mycelium-based habitat construction with bioregenerative systems. This symbiotic relationship optimizes resource utilization in space conditions, addressing challenges posed by resource competition among biological entities. The development roadmap outlines key milestones and technological advancements required for the successful implementation of this integrated approach. Emphasis is placed on tackling challenges associated with resource utilization within the realm of habitat construction, within the architectural context. It underscores the need for meticulous planning and coordination within the bioregenerative framework to optimize the integration of biological materials and biotechnologies into the architectural design. The proposed roadmap offers a foundation for further research and development in the field of extraterrestrial habitat construction, fostering a multidisciplinary approach to human space exploration.