Paper ID: 70244
student

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support, habitats and EVA Systems (7)

Author: Mr. Ramandeep Shergill
University College London (UCL), United Kingdom

BIOREGENERATIVE POSTHUMAN BODYING SYSTEMS

Abstract

Keywords: PLSS, bioregenerative, microalgae, life-support, oxygenic production, sympoiesis, Biological in-Situ Resource Utilization

For interplanetary and deep space exploration scenarios a resilient type of PLSS carapace will be required. Travel to planets in the Solar system, and for further interstellar travel requires the elements of life, including carbon, oxygen, hydrogen, nitrogen, sulphur, phosphorous and more which need to regenerate through physiochemical alliances and symbioses with "other life" forms (Margulis, 2008). This paper addresses the significance of structural and technological aesthetics in constructing a speculatively designed Bioregenerative Posthuman Body Carapace System to expand the human body for future PLSS design. "Posthuman Bodying" is defined as new methodologies in bio-integrated design practice, where the human body expands the pre-existing body critically through assemblages of human and non-human agency. The body is re-established through speculative design, a new identity is formed by the human body engaging in pertinent and critical relations with multispecies entities and contemporary encasement biospheres.

The emergence of wearable aesthetic technologies is reviewed, covering designs and prosthetic extensions to the body as means of protection to underpin the concept of "Bioregenerative Posthuman Bodying." This work innovates architectural surroundings to the body via carapace systems for oxygenic production for systems that can be used beyond LEO particularly on the Moon, Mars and asteroid 16 Psyche. A resilient bioregenerative PLSS is developed, working with the microalgae strain Chlorella Vulgaris, underpinning further experiments with diatom extremophiles. An engineered encasement as an extension to the body is created, enhancing a sympoietic alignment (collectively producing systems) of the human and nonhuman with microorganisms. Bioregenerative methods of oxygen production are established. Systems are embedded with the microalgae Chlorella Vulgaris and oxygenic production from these systems through photosynthesis is evaluated. Data and results are discussed, laboratory processes are illustrated, surveying the potential of bacteria and chitosan assessing the feasibility of organisms which can be worked with in future types of Bioregenerative PLSS devices. Biological in-situ resource utilization is reviewed, on how it can benefit body encasement systems for each environment the Bioregenerative Posthuman Body Carapace is placed in. The examination of pre-existing protective life support systems worn in Space and body encasements on Earth, combined with photobioreactor air revitalization systems is aligned, underpinning the engineering process of the novel bioregenerative PLSS. The outcomes, conclusions from the experiments are assessed and prepared for the feasibility of Technology Readiness Level 5 and above, and recommendations are made for further research.