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Opinion Article

Advances in the Space Colonization and Obstacles

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DESCRIPTION

The outbreak of a global pandemic, one of many reasons encompassing both natural and man-made calamities long proclaimed in the pro-colonization rhetoric, has re-validated the imperative to establish mankind as a multi-planet species. We now have a plethora of information to help us set guidelines for sustaining human life and health for extended durations in the harsh environment of space thanks to the long-term occupation of the international space station by rotating teams of astronauts, scientists, and medical experts [1]. To test the boundaries of human endurance, a number of ambitious programmes have tried to replicate as closely as possible the conditions of off-world living here on Earth. There are undoubtedly many difficult obstacles that would-be space colonists must overcome, including safeguarding against exposure to lethal radiation levels, the effects of long-term living and working in confined, low-gravity environments on the human body, and the psychological effects of being alone, confined, and cut off from society and one's family [2]. Advances in architectural design, the generation of alternative fuels, 3D printing, and low-gravity manufacturing are just a few of the advantages that space colonisation will bring us, either directly or indirectly.

Support for life

Supporters of space colonisation have cited a number of arguments, including the need to safeguard Earth's ecology, gain access to more natural resources, and ensure the survival of the human species in the event of nuclear war or another planetary catastrophe. Space colonisation opponents contend that such initiatives would be a waste of time and money that would be better used to address issues like hunger, poverty, and disease. They also point out that, despite its advantages, it is not possible for humans to leave the Solar System within an acceptable amount of time [3]. In response proponents of space colonisation point out that the cost has been considerably overstated and that the pursuit of such a goal will inspire the united and cooperative efforts of people from different countries.

To live for an extended amount of time, a person needs gravity, food, water, air, and adequate temperatures. On Earth a vast, intricate ecosystem offers these. A relatively small, confined biological system must recycle or import all the nutrients in space settlements to avoid crashing. Perhaps nuclear submarines are the closest terrestrial approximation to space life support [4]. The same fundamental technology that nuclear submarines utilise to keep people alive for months without surfacing could potentially be used to space travel. Nuclear submarines, however, operate in an "open loop" and normally discard carbon dioxide at sea while recycling oxygen. The Sabatier procedure or the Bosch reactions have both been used in the literature to recycle carbon dioxide.

Radiation defence

Alternately and maybe more alluringly the Biosphere 2 project in Arizona has demonstrated that eight people can survive for at least a year in a complicated, tiny, enclosed, man-made biosphere, despite numerous difficulties. It is quite likely that they were able to accomplish atmospheric closure because oxygen had to be refilled about a year into the two-year expedition [5]. A deadly radiation environment is created in space by solar flares and cosmic rays. Living above the Earth's atmosphere is challenging in Earth orbit due to the Van Allen Belts. Settlements must be surrounded by enough bulk to absorb the majority of incoming radiation in order to protect life. Per square metre of surface area 5 to 10 tonnes of material are needed. The leftover material (slag) from processing lunar soil and asteroids into oxygen, metals, and other useful components can be used to accomplish this inexpensively but it poses a considerable challenge to manoeuvring vessels with such enormous volume.

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