

## **Redesigning Living Organisms to Survive on Mars**

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Providing life support for human exploration is a major challenge as we venture to Mars and beyond. This proposal addresses the need to reconsider life forms as we know them and design organisms for survival in the extreme conditions that exist in extraterrestrial environments. We propose to take advantage of insights gained from comparative analysis of the genomes and proteomes of extremophilic microorganisms revealing critical factors essential for surviving selective hostile environments such as cold, heat, UV radiation, anaerobic conditions and lack of water; conditions likely to be encountered in space. Our hypothesis is that we can revolutionize life forms by selectively expressing in plants extremophile genes that will collectively enable functional life in hostile environments. As proof of concept, the phase I goal is to produce functional extremophile proteins in plants. In addition, we will engage an honors undergraduate class in a project to develop a preliminary design of virtual plants to survive on Mars. The longterm goals of this project are to develop new organisms that would be used to provide life support for human space exploration.