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Author: Ms. Kakeru Funai
The University of TOKYO, Graduate school, Japan

Prof. Miles Pennington
University of Tokyo, Japan

GASTRONOMY BEYOND EARTH: ENHANCING SPACE LIFE WITH INNOVATIVE SPACE FOOD

Abstract

Over 50 years have passed since the Apollo 11 moon landing, and space development has made remarkable progress. Now, space agencies and private companies worldwide are planning humanity's expansion beyond the Earth-Moon system to Mars. While previous space endeavors focused solely on "short-term survival" environmental setups, projects like the Artemis program underscore the importance of ensuring "Quality of Life (QOL)" for longer-term human space exploration.

Against this backdrop, this research aims to design space living for the next 10 years. Encompassing the broad field of "Space Living Design", the study adopts a multi-stage experimental design process, setting hypotheses and questions to ultimately propose an innovative future vision.

Initially, through idea generation and concept development, the research was guided by the primary research question of "How can we enrich space living with limited resources?" Subsequently, focusing on food, a series of hypothetical questions were raised to explore ways of enhancing space life through culinary experiences. Ideas ranged from leveraging microgravity for unique dining experiences to utilizing food 3D printers.

This exploration led to two conceptual directions: "Sensory Hack Food" to provide rich dining experiences by hacking the senses in response to the reality that delicious and psychologically comforting meals are not always feasible due to various constraints, and "Material Arrangement Food" to create novel food products by introducing properties and physical structures not traditionally used in food. Prototypes were created and tasted, resulting in "Material Arrangement Food" emerging as a method to enrich space food with limited resources. Specifically, by processing the surface and internal structure of freeze-dried food to create a gradient in water permeability, it becomes possible to generate multiple textures from a single food item or ingredient.

While meeting functional and safety constraints is paramount when considering life-related issues in manned space exploration, innovative processes can efficiently and optimally address constraints and solve problems in new ways. This research not only proposes space food but also aims to stimulate thought and discussion on space habitat design as a starting point, expecting innovation through design methodology to impact the space industry.