

Controlled Environments in Space (Session 5): *(Overview Paragraph)*

Plant experiments conducted in space must by definition be carried out in controlled environments. For example, understanding any responses to weightlessness or obtaining optimal yields for life support applications will require the careful control of temperature, humidity, CO₂, and lighting, along with considering the pertinent reliability and safety issues for space settings.

Spaceflight and related ground-based studies have been carried out for over 30 years using a variety of chambers and environmental control capabilities. The first speaker, Dr. Weijia Zhou (University of Wisconsin, Madison, WI, USA), presented an overview of existing plant chambers for spaceflight research for NASA's Shuttle and the International Space Station, and addressed the challenges of operating these system in a freefall environment with limited power and volume. The second speaker, Mr. Russ Fortson (Lockheed-Martin Space Operations, Johnson Space Center, TX, USA) described larger scale, ground-based chambers that have been used as analogues for crop production systems envisioned for future space colonies, where electrical power and volume would be less constraining. Finally, Dr. Christophe Lasseur (European Space Agency, Noordwijk, Netherlands) presented an overview of biological systems under study for waste processing approaches envisioned for space. These systems use a range of bacteria, algae, and fungi contained within reactors that are environmentally controlled for optimal performance.

The panel-led discussion included the three speakers along with three additional panelists: Dr. Cary Mitchell (Purdue University, West Lafayette, IN, USA), who has worked both with gravitational biological and crop life support system studies; Dr. Alex Hoehn (Univ. of Colorado, Boulder, CO, USA), who has worked as an aerospace engineer both for the European Space Agency and NASA-funded efforts involving commercial biological testing in space, and Dr. Yoshi Kitaya, who has been a long-standing member of the Japanese CELSS Society and active in research related to developing spaceflight plant chambers.

Respectfully submitted,

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