The role of plants in future space endeavors.

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- Plant gravitational & space biology.
- Gravitropism and phototropism in plants.
- ESA Biorack on STS-81 & STS-84; ISS project in development.

- Dr. Chris Brown, N.C. State University
- Dr. Roger Hangarter, Indiana University
- Dr. Karl Hasenstein, University of Louisiana
- Dr. Mary Musgrave, University of Massachusetts
• Basic (fundamental) biology research
• Advanced life support
• Biomonitors
Basic Biological Research

• The role of gravity in evolution.

• Role of the genome and other cell structures in sensing and responding to gravity.

• Interactions between gravity & environmental factors in plant growth and development.
Advanced Life Support

• Concept: human life support system, supplying food, water, and oxygen, open with respect to energy but closed with respect to mass, can operate indefinitely in space without resupply from Earth.

• Needed for long-term spaceflight missions and colonization of other planets.

• Plants: food, oxygen, psychological benefits.
Plants as Biomonitoring

No stress  Stress

- Reporter gene: beta-glucuronidase (GUS)
- Green fluorescent protein (GFP); non-destructive

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Plants as Biomonitor

• Programmable, genetically-engineered plants can initiate production of food, drugs, plastics etc.

• Plants can be engineered for stresses of long-term spaceflight (water-deficients, high ethylene etc.) or unique stresses to other planets (Mars).

• Plants can be engineered to provide a signal if there are problems with the environment for the crew.