

A full-page background image showing an astronaut in a white and orange spacesuit standing on a sandy, rocky desert landscape under a hazy, orange sky. The astronaut is wearing a helmet with 'ARES III' written on it and has a backpack with the number '2' on it. The landscape features rolling sand dunes and several large, jagged rock formations in the distance.

The Hardware and the Humans: Can we Deliver?

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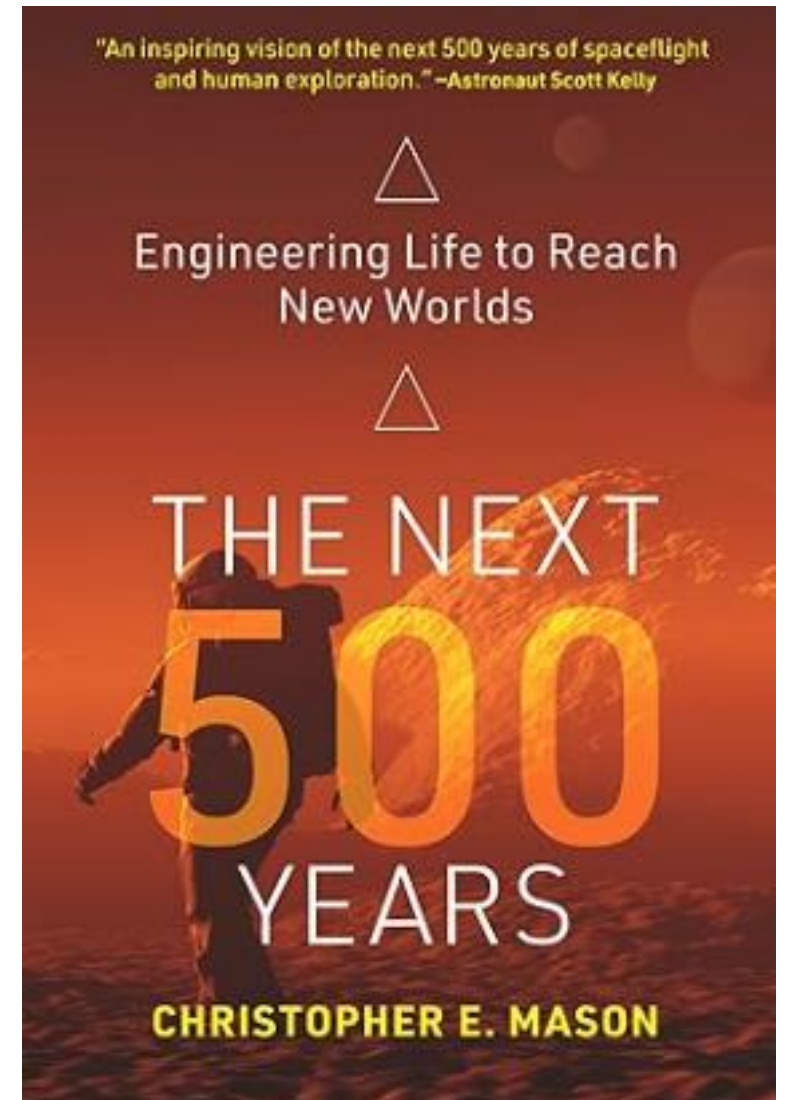
Reducing the Risk of going to Mars

Recent selected major advancements include :

- New gene therapy and bioengineering techniques
- Techniques in food production and sustainability
- Continued investigation of natural resources that Mars possesses that can be utilized
- Artificial intelligence and advanced robotics – our *sixth sense*
 - *Looking out for danger and finding opportunities*
 - *Creating the Holodeck*

Genetically Engineer Mars Astronauts for Physical Resistance and Repair

- Genetic Engineering
 - Epigenetics – Turning on/off selected Genes
 - CRISPR – Gene editing and repair
 - Adding Tardigrade's DNA repair genes
- Microbiome Engineering
- Synthetic Biology for Life Support
- Enhanced Bone and Muscle strength
- New medicines & protective therapies
- Next generation spacesuits & wearable computers



Can Plants
GROW
with
MARS SOIL?

- Vertical Farming
 - Dwarf vegetables
- Extend the growth time
 - Daytime – filtered Sunlight
 - Nighttime – LED lighting

Essential Plant Nutrients

Macronutrients

✓ Oxygen (O)

✓ Carbon (C)

✓ Hydrogen (H)

✓ Nitrogen (N)

✓ Potassium (K)

✓ Phosphorus (P)

✓ Calcium (Ca)

✓ Magnesium (Mg)

✓ Sulfur (S)

Micronutrients

✓ Iron (Fe)

✓ Manganese (Mn)

✓ Zinc (Zn)

✓ Copper (Cu)

✓ Molybdenum (Mo)

✓ Boron (B)

✓ Chlorine (Cl)

✓ = detected on Mars soil,
or in Martian meteorites

Types of Robotic Systems of Interest



Virtual & Augmented Reality

- Training
- Relaxation
- Current research in fighting depression



Star Trek: Holodeck