



Adapting a Flexible BioSensor Platform for Biological Studies on the Moon



Lauren Liddell^{1,4}, Natalie Ball^{2,4}, Jessica Chau^{2,4}, Chinmayee Govinda Raj^{3,4}, Diana Gentry⁴, Jared Broddrick⁴, Sergio Santa Maria⁴, Mark Settles⁴

¹Logyx LLC, ²KBR Wyle, ³Blue Marble Space Institute for Science, ⁴NASA Ames Research Center

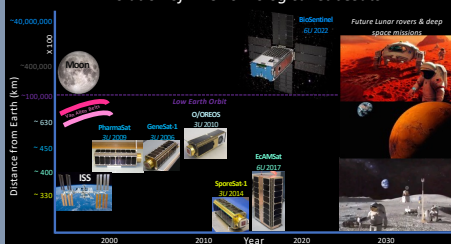
Introduction

- With Artemis missions underway, it's clear we're going *back to the Moon* to stay.
- Before sending Astronauts for long-duration missions, it's crucial to understand the **technological & biomedical countermeasures needed to protect them**.



- We can use **knowledge gained from biological CubeSats** to guide the next generation of experiments to **support human habitation on the Moon**.

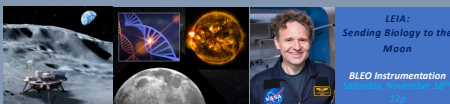
Evolution of NASA's Biological CubeSats



- Lunar Explorer Instrument for space Biology Applications (LEIA)** is a new **BioSensor** adapted from NASA's BioSentinel mission, launched on Artemis I.



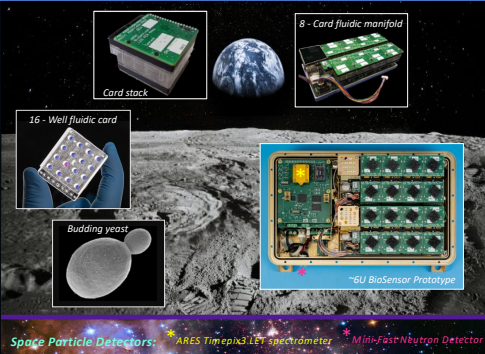
- LEIA aims to identify biological responses to the lunar environment** to inform future missions to the Moon.



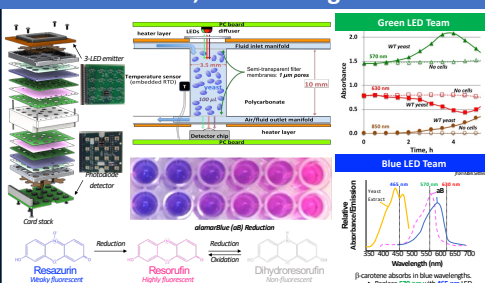
Scientific Aims

- Combine yeast genetics with metabolic modeling** to determine cellular sensitivity to the Lunar environment.
- Evaluate synthetic biology-enabled production of antioxidant nutrients & proteins** under Lunar surface conditions.
- Evaluate genetically engineered yeast** for enhanced tolerance to the Lunar environment.
- Determine the Lunar radiation dose & composition** corresponding to the biological responses measured in Aims 1-3.

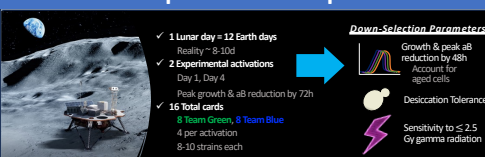
BioSensor Payload



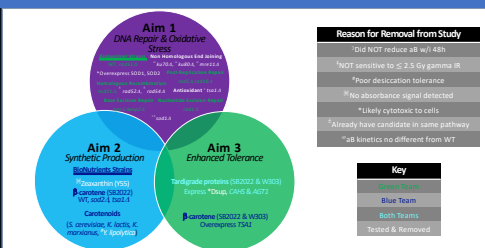
2 Manifolds; 2 LED Configurations



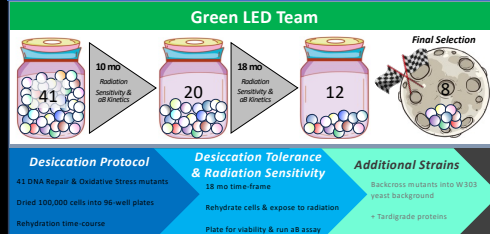
Experimental Scope



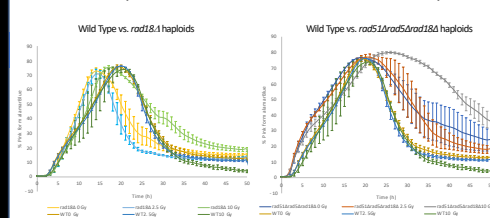
Yeast Strain Selection



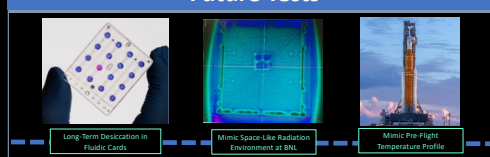
Yeast Strain Down-Selection



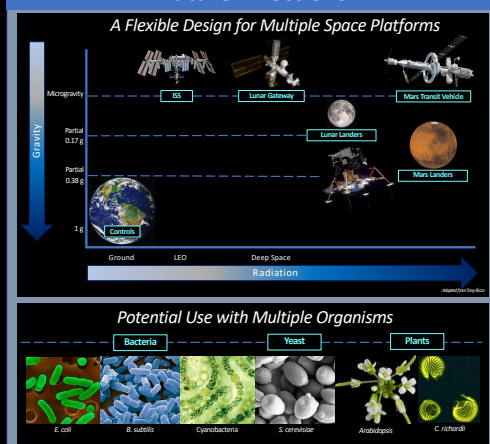
Sensitivity to Gamma Radiation via alamarBlue Assay



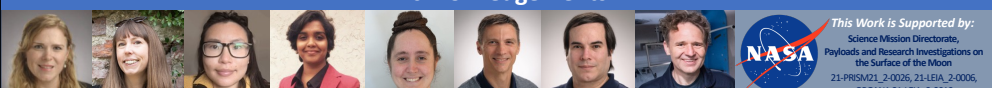
Future Tests



Future Directions



Acknowledgements



This Work is Supported by:
Science Mission Directorate,
Payloads and Research Investigations on
the Surface of the Moon
21-PRISM21_2-0026, 21-LEIA_2-0006,
ORIANA 21-LEIA_2-0010