Bioengineering a Way to Mars: Space Synthetic Biology?

Abstract: Can a human outpost on the red planet be sustained by potatoes from Martian soil? Dr. Nils Averesch and Dr. Jessica Snyder, Scientists for NASA Ames Research Center use bioengineering to assess the feasibility of such options, all to extend human habitation farther into the solar system. While planning a mission to Mars, NASA plans medical care for humans in space using high fidelity models of human anatomy, leveraging advances in tissue engineering, to anticipate physiological changes and disease in a non-Earth environment. During the voyage, biological production of food, pharmaceuticals, and fuel sustains sufficient supplies for the crew, without the expense of moving a heavy and finite payload out of Earth’s gravity well. Once on Mars, a biotechnology approach to the “in situ resource utilization” paradigm uses microbial cell factories to provide life support. Advances in telemedicine and regenerative medicine maintain the link between expert medical care on Earth and the space frontier. Bioengineering holds promise to answer many of the technology gaps between this planet and the next. In addition to their research, Drs. Averesch and Snyder will discuss how they came to work at NASA Ames, how they fit into the work here as early career scientists, and what career opportunities are available for those who are interested in gaining similar experiences.

Biography: Dr. Nils Averesch is the Synthetic Biology Task Lead with Universities Space Research Association as a Visiting Scientist at NASA Ames Research Center in Mountain View, California, USA. He received his PhD in 2016 from the University of Queensland in Brisbane, Australia, where he focused on Metabolic Engineering at the Centre for Microbial Electrosynthesis. He holds an engineer’s degree (Dipl. Ing.) in Biochemical Engineering, from the Technical University of Dortmund in Dortmund, Germany, having graduated in 2011.

Dr. Jessica Snyder is a Visiting Scientist with Universities Space Research Association contracted to NASA Ames Research Center in Mountain View, California, USA. She received her PhD in 2014 from Drexel University’s Mechanical Engineering Department, where she studied drug metabolism in microgravity by engineered a 3D bioprinting system to build living, anatomical models of human liver. She went on to a postdoctoral position with Massachusetts Institute of Technology’s Senseable City Lab to study microbiomes of cities by wastewater sampling.