

2023 Life Sciences in Space Scoping Workshop

Dr. Jennifer Talley | October 17-19, 2023 | Arlington, VA - hybrid

Basic Research Innovation Collaboration Center (BRICC)
4100 N Fairfax Drive, Suite 450 | Arlington, VA 22203

Agenda Day 1 | October 17, 2023

Objectives of workshop:

Understand the current capabilities in the space domain.

Understand the current challenges in the space domain including competitor activities.

Understand what the future challenges look like in the space domain.

Understand what other federal agencies are doing in/for the space domain.

What is the role for the Air Force and Space Force and how can our research collaborate and contribute to this operational environment for these future challenges against competitors?

Time	Topic	Speaker
0815-0900	Check in and badging at BRICC	
0900-0930	Introduction to Workshop	Dr. Jennifer Talley, AFOSR
0930-1030	Keynote- China's Space Goals and Ambitions	Dr. Namrata Goswami
1030-1100	BREAK	
1100-1130	BRICC's Technology Transfer and Transition Capabilities	Dr. Sunny Shahhaidar
1130-1330	LUNCH	

Lightning Talks on Biological Materials in and for Space (10 minutes or less)

1300-1400	Space Biology at NRL	Dr. Zheng Wang, Naval Research Laboratory
	Melanized Microbes for Multiple Uses in Space	Dr. Tiffany Hennessee, Naval Research Laboratory
	Our objective is to develop melanized microorganisms as production hosts for biomaterials in spaceflight conditions. We plan to cultivate melanin-producing microbes aboard the International Space Station (ISS) and investigate changes that promote resiliency and survivability in space conditions and characterize the unique properties of bio-products.	
	Natural Materials and System Portfolio	Dr. Bennett Ibey, AFOSR
	Biomaterials Research and Space Applications	Dr. Nancy Kelley-Loughnane, AFRL/RXEB
	Air Force Research Laboratory is applying synthetic biology to address materials developments in three specific areas for the Department of Defense: 1) specialty materials, 2) hierarchical materials, and 3) multifunctional/living materials. Harnessing the strength of molecular biology, metabolic engineering, and system biology into a	

	powerful pipeline for modern biotechnology, synthetic biology provides promising ways to create materials normally not easily achievable through traditional chemical synthesis or additive manufacturing. The AFRL biomaterial research area seeks to accelerate materials development, protect assets from the environment, and enable airman performance. Our technical thrusts include bio-directed synthesis for capabilities and resilient manufacturing, bioprocessing to harness resources, and materials for warfighting systems interfaces. Further development of these technologies and improvements in biomanufacturing processes will expand the current capability for the advancement of materials research in the military environment.	
	Modular Solid Nano-Bioreactors for Biomanufacturing in Space	Dr. Oscar Ruiz, AFRL/RXEB
1400-1500	BREAK	
1500-1600	Small group discussions with pre-set questions for Biological Materials	
1600-1700	Out briefs of small for Biological Materials	
1700	Review Adjourn	
1700	No-host social: Bronson Bierhall 4100 Fairfax Dr, Arlington, VA 22203	

Agenda Day 2 October 18, 2023		
Time	Topic	Speaker
0815-0900	Check in and badging at BRICC	
Lightning Talks on Living Organisms and Communities in Space (with a break)		
0900-1200	DARPA Survival, Utility, and Reliability beyond Earth (B-SURE)	Dr. Anne Cheever, DARPA/BTO
	Potential for Biomanufacturing in Space	Dr. Rebecca Mickol, Naval Research Laboratory
	Abstract: Numerous bacteria can be exploited for human use, particularly in the field of biomanufacturing. Our lab maintains a marine, hydrocarbon-degrading bacterium that naturally forms biofilms and produces wax esters, a type of lipid that functions as lubricants and fuels, among other applications. However, how do the effects of microgravity and enhanced radiation affect the production of useful biomolecules? To establish permanent bases in space, in situ resource utilization and limiting the weight/footprint of supplies necessary to establish these bases is vital. This bacterium could be re-hydrated in space, in non-potable water, degrade waste products, and produce useful biomolecules all-in-one.	
	SPOC: Space Physiology through Organ-on-a-Chip. Currently, the NIH is funding multiple projects that utilize microphysiological system technology to examine altered mechanisms of action in specific	Dr. Brooke Ahern, U.S. Army DEVCOM Chemical Biological Center

	tissues and organ systems, both in space and in simulation. We aim to apply this concept to investigate how chemical and biological threats could affect the space warfighter.	
	Humans in space endure physiological changes that mimic abnormal physiological perturbations on Earth that typically take months/years to develop. The investigations of these mechanisms become costly in time and money. However, the lack of gravity promotes the onset and progression of pathology.	
	The Pocket Detection Pouch: Detection in Austere Environments	Dr. Jennifer Sekowski, US Army DEVCOM CBC
	Designed with feedback from warfighters, the Pocket Detection Pouch (PDP) is a small, lightweight, power-free, and inexpensive, chemical and biological detection device that can be customized for a variety of detection applications. Its unique design includes a multi-channeled plastic pouch with an inner compartment that separates the sample into individual testing chambers using a one-way sample flow process. Developed to perform multiple eye-readable detection assays simultaneously from a single wet or dry sample, the PDP can perform multiple paper-based or lateral flow-based detection assays at the same time from a single sample. Since the small device requires no specialized equipment or power it is more practical in austere or resource-constrained environments where a rapid presumptive ID is needed in a manner that is predictable and accelerated.	
	Low-dose, Noninvasive Biodosimetry	Michael Patterson, IARPA TEI-REX
	Metacognition and Decision Making	Dr. Robert Patterson, RHWID
	Effective decision making requires effective metacognition (active control, optimization of thinking, decision making). A common assumption in the human-machine teaming literature is that human metacognition involves conscious, verbal access to high-level cognitive processing—people generally know, and verbalize, reasons for their decisions. However, significant evidence exists outside that literature which indicates that there may be little or no direct conscious-verbal access to high-level cognitive processes. People may not consciously know actual reasons for decisions they make. They may be confabulating and making metacognitive errors in thinking and reporting without knowing they are doing so. We report results of a study on metacognitive error.	
	NASA ARC Support for Human Space Exploration	Dr. Egle Cekanaviciute, NASA Ames Research Center
	Introducing the current efforts at NASA Ames Research Center in support of the NASA Human Research Program and potential shared goals and venues for collaboration with the U.S. Air Force / U.S. Space Force.	
	The NASA Human Research Program: Overcoming the Challenges of Exploration Spaceflight	Dr. Kristin Fabre, NASA
	The NASA Human Research Program mission is to “enable space exploration beyond Low Earth Orbit by reducing the risks to human health and performance.” Space exploration involves 5 unique hazards that could impact crew physiological and psychological health, which are radiation, isolation, distance from Earth, environment and extended time in	
	Space Biology: Multi-stressors and model organisms	Dr. Lynn Harrison, NASA BPS
1200-1400	LUNCH	

1400-1500	Small group discussions with pre-set questions for Living Organisms and Communities	
1500-1600	BREAK	
1600-1700	Out briefs of small groups for Living Organisms and Communities	
1700	Review Adjourn	
1700	No-host social: Rustico 4075 Wilson Blvd, Arlington, VA 22203	

Agenda Day 3 October 19, 2023		
Time	Topic	Speaker
0815-0900	Check in and badging at BRICC	
0900	Introduction to Day 3	Dr. Jennifer Talley, AFOSR
Lightning Talks on Testing, Simulation, Quantification in Space (30 minutes talks)		
0900-1030	DoD Space Test Program	David Callaway, DoD Space Test Program (SSC/SZI OL-S)
	How the DoD Space Test Program facilitates DoD research in space, specifically tailored to life sciences, and how to access our processes.	
	NASA's Biological and Physical Sciences Division Research in the Post ISS Era	Dr. DeVon Griffin, NASA/Biological and Physical Sciences
	For over one decade, NASA's Biological and Physical Sciences (BPS) Division has sponsored space biology investigations on the International Space Station (ISS). With ISS end of life planned for 2030, BPS is now planning for research locations to execute priority science recommended by the 2023 National Academies of Science, Engineering and Medicine's Decadal Survey. BPS envisions using commercial space stations in low Earth orbit, free flying cubesat-type satellites, and investigations as ride share on Artemis missions, as well as missions sponsored by other Science Mission Directorate divisions, such as Earth Science and Planetary Science.	
	International Space Station (ISS) National Laboratory (ISSNL) Overview ("tentative")	Dr. Donna Roberts, ISS National Lab
1030-1100	BREAK	
1100-1200	Small group discussions with pre-set questions for Testing, Simulation, Quantification	

1200-1330	LUNCH	
1330-1400	NASA Suborbital Crew (SubC)	Mr. Chris Gerace, NASA/SubC
	Will provide a short overview of our work with both Blue Origin and Virgin Galactic to assess their suborbital systems for Civil Servant tended research.	
1400-1500	Out briefs of small groups for Testing, Simulation, Quantification	
1500-1530	Wrap up for Workshop	Dr. Jennifer Talley, AFOSR
1530	Review Adjourn	