Fiscal Year:	FY 2021	**Task Last Updated:**	FY 04/06/2021
PI Name:	Gilroy, Simon Ph.D.		
Project Title:	Spaceflight Effects on Plant-Microbe Interactions		
Division Name:	Space Biology		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	None		
Human Research Program Risks:	None		
Space Biology Element:	(1) Cell & Molecular Biology (2) Microbiology (3) Plant Biology		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	53706-1313	**Congressional District:**	2
Comments:	NOTE: PI formerly at Pennsylvania State University; moved to University of Wisconsin-Madison in 2007 (Info received 7/2009)		
Project Type:	FLIGHT,GROUND	**Solicitation / Funding Source:**	2018 Space Biology (ROSBio) NNH18ZTT001N-FG2. App D: Flight and Ground Space Biology Research
Start Date:	04/01/2021	**End Date:**	03/31/2024
No. of Post Docs:		**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NASA KSC
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Flight Program:	ISS		
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Bakshi, Arkadipta Ph.D. (University of Wisconsin, Madison) Swanson, Sarah Ph.D. (University of Wisconsin, Madison) Barker, Richard Ph.D. (University of Wisconsin System) Hanson, David Ph.D. (University of New Mexico)		
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Performance Goal No.:			
Performance Goal Text:			

Task Description:	This proposal seeks to address two of the major goals of the current research announcement: (1) assessing how spaceflight modulates the interactions between plants and microbes and (2) how well microgravity analogs capture the events elicited by the spaceflight environment. Tomato plants will be grown on orbit in the NASA Vegetable Production System (Veggie) hardware on board the International Space Station (ISS) with and without the beneficial rhizosphere microbe Trichoderma hazianum. A third sample will be of this microbe growing under identical conditions on the ISS but without the plants. These samples will be compared to parallel ground controls at 1 x gravity as well as to samples growing on 1-axis and 3D clinostats and on random positioning machines. Assays will integrate RNAseq-based transcripomics and ionomics (nutrient uptake and distribution) alongside biochemical measures of photosynthesis and stress. These comparisons will allow us to ask both how spaceflight affects the plant, the microbe, and the relationship between these organisms and additionally, how well microgravity analogs can reproduce these kinds of events on the ground. In addition, we will compare the omics-level data gathered from this study to the wealth of spaceflight-related omics data available through the GeneLab data repository. We will use an approach of orthologous matrix mapping that allows identification of similar genes between diverse species and so allows comparisons of, for example, the degree of similarity between patterns of gene expression to be compared between different species. Overall this research will help define how spaceflight may modulate plant, microbial, and plant-microbe responses and help understand whether defined beneficial microbes may provide a countermeasure to the deleterious effects of spaceflight on plants. The work will capitalize on the complementary expertise of two groups: the Gilroy lab team (plant spaceflight, transcriptomics) and the Hanson lab (biochemistry, photosynthesis). Specifically, we propose to: (1) Analyze the kinetics of growth and the transcriptome, ionome, and photosynthetic responses of tomato plants to spaceflight. (2) Compare these responses in plants growing with or without the beneficial root symbiotic microbe Trichoderma harzianum. (3) Use comparisons to ground-based control experiments, clinostats, and random positioning machines to ask whether such changes are likely linked to the microgravity element of spaceflight and how far these ground-based microgravity analogs really do trigger responses seen in the spaceflight environment.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2021.
Bibliography Type:	Description: (Last Updated: 04/23/2024)