Task Book Report Generated on: 03/28/2024

P. Name: O'Council-Rodwell, Cartlin Ph.D.	Fiscal Year:	FY 2019	Task Last Updated:	FY 03/25/2019
Division Name: Space Biology Program/Discipline: Program/Discipline: Program/Discipline- Element/Subdiscipline- Element/Subdiscipline- Joint Agency Name: TechPort: No Human Research Program Element: None Space Biology Research Program Relists: None Space Biology Research (1) Cell & Molecular Biology Space Biology Special Category: None Space Biology Special Category: None PI Email: coscons/Biology Agency First Program Relists: None Space Biology Special Category: None PI Email: coscons/Biology Agency First Program Relists: None PI Email: coscons/Biology Agency First Program Relists PI Address 1: 350 Hoohana St PI Address 2: FI Address 2: FI Address 2: FI Address 3: FI Address 3	PI Name:	O'Connell-Rodwell, Caitlin Ph.D.	*	
Program/Discipline:	Project Title:			
Program/Discipline:				
Program/Discipline- Element/Subdiscipline- Element/Subdiscipline- None TechPort: No None		Space Biology		
BemertSubdiscipline: TechPort: No No	Program/Discipline:			
Human Research Program Elements None				
Human Research Program Risks: None Space Biology Space Biology Cross-Element (1) Cell & Molecular Biology Space Biology Cross-Element (1) Neurobiology Space Biology Cross-Element (1) Neurobiology Space Biology Special Category: None Fax: PY	Joint Agency Name:		TechPort:	No
Space Biology Element: (1) Cell & Molecular Biology Space Biology Cross-Element Discipline: (1) Neurobiology Space Biology Special Category: None PI Email: zoconnel@inuphotomics.com Fax: FY PI Organization Type: INDUSTRY Phone: 69-868-2251 Organization Name: HNu Photonics LLC Fax: FY PI Address 1: 350 Hoohana St Fax: FY PI Address 2: FLI Address 2: FLIGHT State: HI Clity: Kahului State: HI Zip Code: 69732-2931 Congressional District: 2 Comments: FLIGHT Solicitation / Funding Source: Number of Panding Source: Number of P	Human Research Program Elements:	None		
Space Biology Cross-Element Discipline: (1) Neurobiology Space Biology Special Category: None PI Email: scoonnell/ofmumbotonics.com Fax: FY PI Organization Type: INDUSTRY Phone: 650-868-2251 Organization Name: HNu Photonics LLC PI Address 1: 350 Hoohana St PI Address 2: PI Web Page: City: Kahului State: HI Zip Code: 96732-2931 Congressional District: 2 Comments: Surround Space Biology (ROSBio) Project Type: FLIGHT Solicitation / Funding Month of Photonics LCC Start Date: 0401/2019 End Date: 03/31/2021 No. of PhD Dardidates: No. of PhD Degrees: No. of Bachelor's Candidates: No. of Master' Degrees: No. of Bachelor's Candidates: No. of Master' Degrees: No. of Bachelor's Candidates: Monitoring Center: NASA ARC Contact Monitor: State, v. salo/ofmssa.gov Flight Program: ISS Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Willband, Brittany M.S. (HNU Photonics LLC) Willband, Brittany M.S. (HNU Photonics LLC) Willband, Brittany M.S. (HNU Photonics LLC) Silverman, Michael Ph.D. (Simon Fraser University, Canada) Ridgley, Devin Ph.D. (HNU Photonics LLC) Willband, Brittany M.S. (HNU Photonics LLC) Willband, Brittany M.S. (HNU Photonics LLC) Silverman, Michael Ph.D. (Simon Fraser University, Canada) Ridgley, Devin Ph.D. (HNU Photonics LLC) Willband, Brittany M.S. (HNU Photonics LLC)	Human Research Program Risks:	None		
Discipline: " None	Space Biology Element:	(1) Cell & Molecular Biology		
PI Email:		(1) Neurobiology		
Pl Organization Type: NDUSTRY Phone: 650-868-2251 Organization Name: HNu Photonics LLC Pl Address 1: 350 Hoohana St Pl Address 2: Pl Web Page: City: Kahului State: HI Zip Code: 96732-2931 Congressional District: 2 Comments: FLIGHT Solicitation / Funding Nound Space Biology (ROSBio) NNHI6ZTTOOIN-FG. App G: Flight Project Type: PLIGHT Solicitation / Funding and Ground Space Biology (ROSBio) NNHI6ZTTOOIN-FG. App G: Flight Source: No. of PhD Degrees: No. of PhD Candidates: No. of PhD Degrees: No. of PhD Candidates: No. of Master' Degrees: No. of Master's Candidates: No. of Master' Degrees: No. of Master's Candidates: No. of Bachelor's Degrees: No. of Bachelor's Candidates: Monitoring Center: NASA ARC Contact Monitor: Sato, Kevin Contact Phone: 650-604-1104 Contact Email: kevin.v.salo@nasa.gov Flight Program: ISS Flight Assignment: Key Personnel Changes/Previous Pl: COI Name (Institution): Wilbrand, Brittany M.S. (INU Photonics LLC) Wilbrand, Brittany M.S. (INU Photonics LLC) Silverman, Michael Ph.D. (Simon Fraser University, Canada) Ridgley, Devin Ph.D. (HNU Photonics LLC) Grant/Contract No.:	Space Biology Special Category:	None		
Organization Name: HNu Photonics LLC PI Address 1: 350 Hoohana St PI Address 2: PI Web Page: City: Kahului State: HI Zip Code: 96732-2931 Congressional District: 2 Comments: Project Type: FLIGHT Solicitation / Funding Source: NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) NH16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) Nh16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) Nh16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) Nh16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) Nh16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) Nh16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) Nh16ZT17001N-FG. App Gr. Flight and Foround Space Biology (ROSBio) Nh16Z	PI Email:	coconnell@hnuphotonics.com	Fax:	FY
PI Address 1: 350 Hoohana St PI Address 2: PI Web Page: City: Kahului State: HI Zip Code: 96732-2931 Congressional District: 2 Comments: Project Type: FLIGHT Solicitation / Funding Source: NN1H6ZT1001N-FG. App G: Flight and Ground Space Biology (ROSBio) NN1H6ZT1001N-FG. App G: Flight and Ground Space Biology Research Source: No. of PhD Degrees: No. of Post Docs: No. of PhD Degrees: No. of PhD Candidates: No. of Master' Degrees: No. of Master's Candidates: No. of Master' Degrees: No. of Bachelor's Candidates: No. of Master' Degrees: No. of Bachelor's Degrees: No. of Bachelor's Candidates: No. of Master's Candidates: No. of Master	PI Organization Type:	INDUSTRY	Phone:	650-868-2251
PI Address 2: PI Web Page: City: Kahului State: HI Zip Code: 96732-2931 Congressional District: 2 Comments: Project Type: FLIGHT Solicitation / Funding Source: MNH 6ZT1001N-FG. App G: Flight and Ground Space Biology (ROSBio) NNH 6ZT1001N-FG. App G: Flight and Ground Space Biology Research No. of PhD Degrees: No. of Post Docs: No. of PhD Degrees: No. of Master's Candidates: No. of Master' Degrees: No. of Bachelor's Candidates: No. of Master' Degrees: No. of Bachelor's Degrees: No. of Bachelor's Candidates: No. of Master's Candidates: No. of Bachelor's Contact Homitoric Center: NASA ARC Contact Email: Revir N. Sato, Kevin Contact Homitoric Center: NASA ARC Contact Email: Revir N. Sato, Kevin Contact Homitoric Center: NASA ARC Flight Program: ISS Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Signman, Michael PhD. (Simor Fraser University, Canada) Ridgley, Devin Ph.D. (HNU Photonics LLC) Signman, Michael PhD. (Simor Fraser University, Canada) Ridgley, Devin Ph.D. (HNU Photonics LLC) Ridgley, Devin Ph.D. (HNU Photonics LLC)	Organization Name:	HNu Photonics LLC		
Pl Web Page: City:	PI Address 1:	350 Hoohana St		
City: Kahului State: HI Zip Code: 96732-2931 Congressional District: 2 Comments: Project Type: FLIGHT Solicitation / Funding Source: 2016-17 Space Biology (ROSBio) NNH16ZTT001N-FG. App G: Flight and Ground Space Biology Research Start Date: 04/01/2019 End Date: 03/31/2021 No. of Post Does: No. of PhD Degrees: No. of Master' Degrees: No. of PhD Candidates: No. of Bachelor's Degrees: No. of Bachelor's Candidates: Monitoring Center: NASA ARC Contact Monitor: Sato, Kevin Contact Phone: 650-604-1104 Contact Email: kevin.y.sato@nasa.goy Flight Program: ISS Flight Assignment: Key Personnel Changes/Previous PI: Col Name (Institution): Loh, Sylvia M.S. (HNU Photonics LLC) Willbrand, Brittany M.S. (HNU Photonics LLC) Willbrand, Brittany M.S. (HNU Photonics LLC) Sylvic rowspan="2">Rowspan="2">Rowspan="2">Rowspan="2">Rowspan="2">Rowspan="2">Rowspan="2">Rowspan="2">Rowspan="2">Rowspan="2">Rowspan="2">Rowspan="2	PI Address 2:			
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Comments: Project Type: FLIGHT Solicitation / Funding Source: NH16ZT1001N-FG. App G: Flight and Ground Space Biology (ROSBio) NH16ZT1001N-FG. App G: Flight and Ground Space Biology Research Start Date: 04/01/2019 End Date: 03/31/2021 No. of PbD Candidates: No. of PhD Degrees: No. of Master' Degrees: No. of Master's Candidates: No. of Master's Candidates: No. of Master's Candidates: No. of Bachelor's No. of Bachelor'	City:	Kahului	State:	НІ
Project Type: FLIGHT Solicitation / Funding Source: NH 16ZTT001N-FG. App G: Flight and Ground Space Biology (ROSBio) NH 16ZTT001N-FG. App G: Flight and Ground Space Biology Research Start Date: 04/01/2019 End Date: 03/31/2021 No. of Post Docs: No. of PhD Degrees: No. of PhD Candidates: No. of Master' Degrees: No. of Master's Candidates: No. of Master' Degrees: No. of Master's Candidates: No. of Bachelor's Degrees: No. of Bachelor's Degrees: No. of Bachelor's Candidates: Monitoring Center: NASA ARC Contact Monitor: Sato, Kevin Contact Phone: 650-604-1104 Contact Email: Revin.v.sato@nasa.gov Flight Program: ISS Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Silverman, Michael Ph.D. (Simon Fraser University, Canada) Ridgley, Devin Ph.D. (HNU Photonics LLC) Grant/Contract No.: 80NSSC19K0715 Performance Goal No.:	Zip Code:	96732-2931	Congressional District:	2
Project Type: FLIGHT Source:	Comments:			
No. of Post Docs: No. of PhD Candidates: No. of Master' Degrees: No. of Master's Candidates: No. of Master's Candidates: No. of Bachelor's Degrees: No. of Bachelor's Candidates: No. of Master' Degrees: No. of Master	Project Type:	FLIGHT		NNH16ZTT001N-FG. App G: Flight
No. of PhD Candidates: No. of Master' Degrees: No. of Master's Candidates: No. of Bachelor's Candidates: No. of Master' Degrees: N	Start Date:	04/01/2019	End Date:	03/31/2021
No. of Master's Candidates: No. of Bachelor's Degrees: No. of Bachelor's Candidates: No. of Bachelor's Candidates: Monitoring Center: NASA ARC Contact Monitor: Sato, Kevin Contact Phone: 650-604-1104 Contact Email: kevin.y.sato@nasa.gov Flight Program: ISS Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Loh, Sylvia M.S. (HNU Photonics LLC) Willbrand, Brittany M.S. (HNU Photonics LLC) Silverman, Michael Ph.D. (Simon Fraser University, Canada) Ridgley, Devin Ph.D. (HNU Photonics LLC) Grant/Contract No.: 80NSSC19K0715	No. of Post Docs:		No. of PhD Degrees:	
No. of Master's Candidates: No. of Bachelor's Candidates: No	No. of PhD Candidates:		No. of Master' Degrees:	
Contact Monitor: Sato, Kevin Contact Phone: 650-604-1104 Contact Email: kevin.y.sato@nasa.gov Flight Program: ISS Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Loh, Sylvia M.S. (HNU Photonics LLC) Willbrand, Brittany M.S. (HNU Photonics LLC) Silverman, Michael Ph.D. (Simon Fraser University, Canada) Ridgley, Devin Ph.D. (HNU Photonics LLC) Grant/Contract No.: 80NSSC19K0715 Performance Goal No.:	No. of Master's Candidates:			
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Flight Program: Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Silverman, Michael Ph.D. (Simon Fraser University, Canada) Ridgley, Devin Ph.D. (HNU Photonics LLC) Grant/Contract No.: 80NSSC19K0715 Performance Goal No.:	Contact Monitor:	Sato, Kevin	Contact Phone:	650-604-1104
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COI Name (Institution): Loh, Sylvia M.S. (HNU Photonics LLC) Willbrand, Brittany M.S. (HNU Photonics LLC) Silverman, Michael Ph.D. (Simon Fraser University, Canada) Ridgley, Devin Ph.D. (HNU Photonics LLC) Grant/Contract No.: 80NSSC19K0715 Performance Goal No.:	Flight Assignment:			
COI Name (Institution): Willbrand, Brittany M.S. (HNU Photonics LLC) Silverman, Michael Ph.D. (Simon Fraser University, Canada) Ridgley, Devin Ph.D. (HNU Photonics LLC) Grant/Contract No.: 80NSSC19K0715 Performance Goal No.:	Key Personnel Changes/Previous PI:			
Performance Goal No.:	COI Name (Institution):	Willbrand, Brittany M.S. (HNU Photonics LLC) Silverman, Michael Ph.D. (Simon Fraser University	y, Canada)	
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Crew members onboard the International Space Station (ISS) exhibit a range of microgravity induced physiological dysfunctions during extended missions (>1 month). Some of the most common effects of long-term microgravity exposure include immune system dysregulation, skeletal muscle atrophy, cardiovascular decline, bone loss, cognitive impairments, and decreased motor control. Unfortunately, the underlying etiology of microgravity induced dysfunction remains unclear. Decades of NASA research on ISS and shuttle missions have demonstrated that mammalian cell cultures exhibit altered morphology, proliferation, motility, differentiation, and often increased oxidative stress when exposed to the microgravity environment. Thus, physiological dysfunction at the tissue and systemic level is likely a result of altered cellular function, subcellular structural alterations, and intracellular communications. It has been well documented that the lack of gravity on-orbit has resulted in a cytoskeletal structural reorganization within a host of adherent mammalian cell cultures. Altered microtubule organization has enormous significance in the context of neurite outgrowth and neuronal intracellular communications. Intracellular effects may include the inability to clear aging and toxic proteins, a loss of trophic factor signaling, and compromised cellular energetics, resulting in axonopathies, synaptic loss, and eventual neuron death. Intracellular trafficking of vesicles is a fundamental subcellular process that can significantly alter cellular, tissue, and systemic processes if impaired in microgravity. Previous studies on Earth have demonstrated that disrupted intracellular communication contributes to abnormal physiological processes and that intracellular processes are sensitive to cytoskeletal organization. Thus, it is likely that microtubule reorganization in microgravity impairs neurite outgrowth, intra- and intercellular communications. However, the extent to which microgravity affects neuron microtubule structure dynamics remains unknown. We hypothesize that neuron microtubule organization is altered in microgravity which leads to inhibited neurite outgrowth and reduced intracellular vesicle trafficking which ultimately contributes to the cognitive impairments, motor control decline, and reduced neuroplasticity observed in microgravity.

Task Description:

To characterize neuronal function in microgravity, we will quantify microtubule structure dynamics and intracellular vesicle trafficking utilizing the innovative Mobile SpaceLab (MoSL) platform to perform autonomous fluorescence microscopy and microfluidic delivery for the duration of a 4-week mission on-orbit. This investigation will seek to quantify vesicle transport, microtubule organization, neurite outgrowth, cell proliferation, differentiation, and motility with fluorescently labeled SH-SY5Y neuroblastoma cells. Ground control experiments with replicate hardware will be compared to the microgravity MoSL experiment. Preliminary results with the ground based MoSL facility demonstrate that microtubule structure and vesicle transport can be observed in real-time during long-term experimentation. This work will seek to 1) quantify the effect of microgravity on neuron microtubule organization and neurite outgrowth during differentiation, 2) quantify the effects of microgravity on intracellular vesicle trafficking within terminally differentiated neurons, and 3) delineate the effects of microtubule polymerization on neuronal structure and intracellular communication. This study will be the first of its kind to observe and quantify differentiating neuron function in microgravity on a minute to hour basis during a long-duration mission. This research has far reaching implications towards understanding the effects of microgravity on neuroplasticity, which may lead to future drug targets and therapeutic interventions to attenuate the deleterious effects of long-term microgravity exposure on human physiology.

Rationale for HRP Directed Research:

Research Impact/Earth Benefits:

Task Progress:

New project for FY2019.

Bibliography Type:

Description: (Last Updated:)