SPACE LIFE SCIENCES TRAINING PROGRAM

NASA Ames Research Center
Moffett Field, California
Summer 2023


Faisal


Brian


Katarina


Nathan

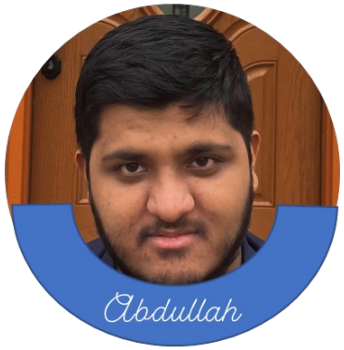

Anisha


Dillon

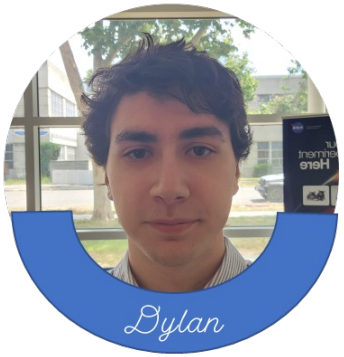
SLSTP 2023


Payne


Kristen


Abdullah


Sophia


Dylan


Tommy

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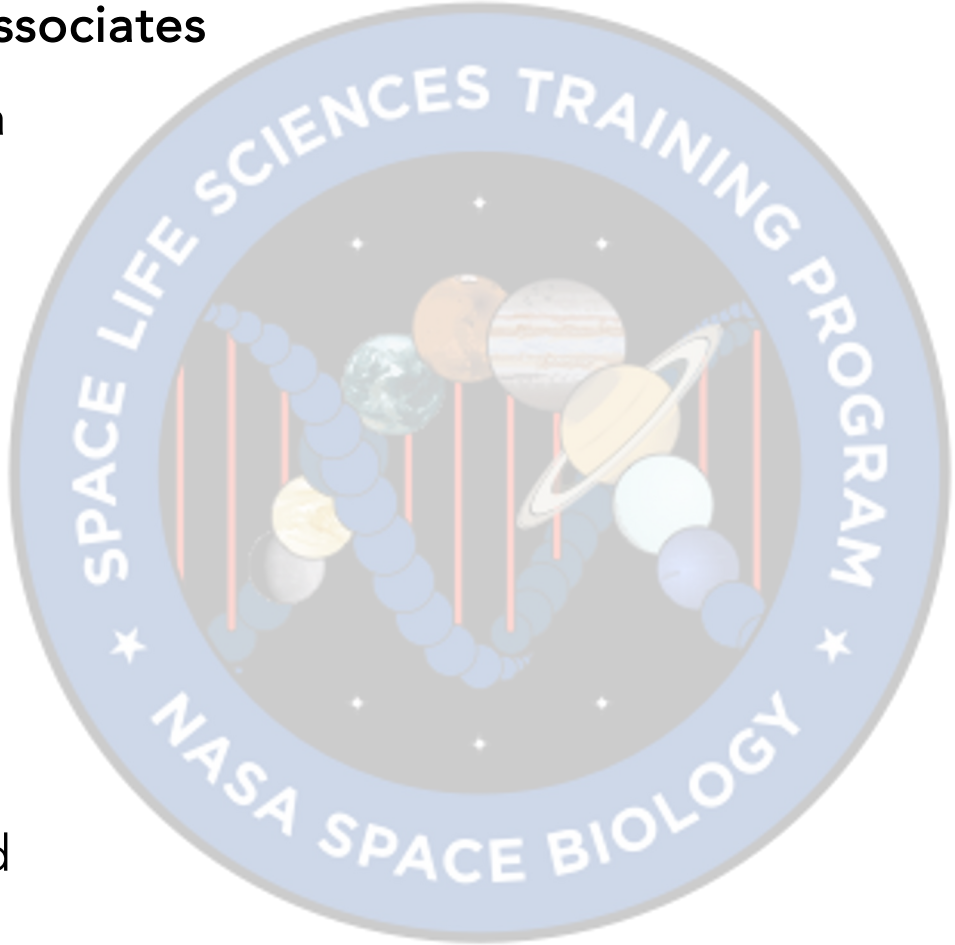

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Executive Summary

The NASA Ames Space Life Sciences Training Program (SLSTP) is a unique summer institute of higher learning. The objective is to produce technically skilled scientists and engineers with the potential to become leaders in the US space program by providing a glimpse into the many disciplines that are required to conduct biological research in space. The success of the program is a result of the interaction of government, academia, and the private sector with each sector playing an essential and key role.

The program was established in 1985 and held at NASA Kennedy Space Center for twenty years, providing an opportunity for undergraduates to learn and experience how life sciences flight experiments are developed, prepared, and conducted. The intensive six-week summer training program exposed students to lecture series and hands-on research in active NASA research and flight support labs.

Over the years, similar education programs were established at other NASA centers to increase student education and interest in the field, and in 2013, SLSTP was piloted at NASA Ames Research Center (ARC). SLSTP at NASA Ames provides opportunities usually unavailable to those outside and within the Agency. The Ames SLSTP is unique in that it focuses on integrating the expertise of multiple disciplines into the space life sciences to gain a better and more comprehensive understanding of what is taking place today in the Space Program and thus, mold its future. SLSTP at NASA Ames continues the tradition of providing undergraduate students entering their junior or senior years with professional experience in space life science disciplines, with the objective of the program being to expose the research associates (RAs) to various aspects of NASA in topics including current research projects, development of unique tools for discoveries in space, tracing the progress of an idea from concept through completion, data analysis to publication, and impacts on science and society. The ten-week intensive summer program includes an important training opportunity where the students collaborate on a group project, which could have the potential of becoming a flight/launch opportunity, a ground study, or a publication, to name a few.

Science Talks, group meetings, network events and Facility tours are also part of the SLSTP internship experience and will help shape the goals and interests of the SLSTP RAs. The success of the SLSTP ultimately depends on the students. One major output of SLSTP is to ensure that the students engage and interact as a "team." Activities spark the development of each student's leadership qualities. Historically the SLSTP program has been held in-person at NASA Ames in Mountain View, California. However, due to the pandemic, the 2020-2022 programs were restructured to be conducted virtually, enabling the program to continue despite the challenging times. This year has been our first return to on-campus activity with a 2023 Program fully held on site!

2023 Research Associates

Northeastern University

Major: Biological Science

PI: Lauren Sanders

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Dillon Nishigaya

Project: Histological and spatial transcriptomic sample preparation from spaceflight stressor exposed rat ovary samples & **SLSTP Staffer 2023**

Since childhood, I began to create a curious fervor for finding tomorrow's cures and transformative research. Through Northeastern University, I traveled to the American College of Thessaloniki, Greece determined to pursue my passions and get involved in research. I became the only undergraduate research assistant, and researched breast cancer and its relation to food additives and preservatives.

Arriving at Northeastern in Boston, I became an undergraduate research assistant at the Laboratory for Aging and Infertility Research. I created and conducted my own award-winning cancer research project entitled "RNA Sequencing Analysis Reveals Distinct Molecular Targets in Chemotherapy Resistant Ovarian Cancer Cells" and a two-time award-winning research project entitled "Bioengineered Mitochondria as Potential Effectors of Cancer Cell Death." In addition to this, I was a member of a full-time summer research pilot program titled REALTIME (Research Experience And Learning Through Integrated Mentorship and Engagement) where I investigated the impact of chemotherapeutics on germline stem cell differentiation and function.

I most recently spent a semester working full-time at Sana Biotechnology in South San Francisco. At Sana, I developed and optimized novel allogeneic chimeric antigen receptor T (CAR T) cell manufacturing processes working side-by-side with a large team of scientists and engineers. I also conducted my own independent research projects.

I am also the co-founder and president of The Undergraduate Research Club at Northeastern and I am part of a research team at the Whited Laboratory at Harvard University's Department of Stem Cell and Regenerative Biology.

I am beyond excited to be an SLSTP staffer and conduct my own research at NASA Ames Research Center this summer!

Purdue University

Major: Biochemistry

PI: Sergio Santa Maria

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Payne Turney

Project: Development and testing of yeast-based biosensors for a lunar surface mission & **SLSTP Staffer 2023**

It would be easy to say that from the day I was born, I wanted to work at NASA. Frankly, that would be too simple of a path to take. From a young age, I pursued a variety of interests. Whether it was competitive swimming or art class, I loved putting forth effort into anything that made me happy. In fifth grade, I joined the cross-country team. What I loved most about distance running was the freedom it offered to explore the world around me. My friends and I would eagerly search for trails in the woods, trying to find secret paths to new places. However, it was not until I got to Purdue that I realized that the next greatest exploration was up toward the stars.

I came to Purdue to study biochemistry. From taking a high school biology class, I was interested in learning more about anything health-related and knew that biochemistry could open doors to any career I wanted to pursue. After my freshman year, I started working in a research laboratory that studied fungal pathogen drug resistance. I spent two years growing yeast, optimizing drug concentrations, and overall, applying the scientific methods I had learned in my classes. In 2022, I participated in a fellowship program on campus where I culminated my studies in a presentation at the Purdue Summer Research Symposium. During the time of my fellowship, I spent a lot of time at the lab bench, where I started listening to “Houston, We Have a Podcast”, the official podcast of the Johnson Space Center. This was when I was first introduced to deep space biology and the notion that experiments similar to what I was doing on Earth could reach the moon and beyond. I listened to any podcast episode that covered health, life in space, and biology. The dedication of NASA scientists to enable sustainable life in space fascinated me, igniting a strong desire to be a part of their work.

All of these experiences have taught me how to use my curiosity and passions to forge a future, whether it be reaching for the stars or making a difference on Earth. Alongside my academic pursuits, I’ve had the immense pleasure of continuing my love for running by competing at the Division I level on the cross country and track team, fostering leadership skills and forming lifelong friendships. With this in mind, I am both honored and excited to work with the NASA SLSTP team this summer and contribute to the next steps in building a sustainable life in space.

University of Illinois at Urbana-Champaign

Major: Psychology, Bioengineering

PI: Stephanie Puukila

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Faisal Ahmad

Project: Efficacy of Dried Plum vs. Multi-Targeted Dietary Supplement to Countermeasure Radiation Exposure

When I initially began my college journey at the University of Illinois, I was amazed by the world of biology. The intricacies of living organisms and their underlying genetic mechanisms that allowed them to function fascinated me, and I was certain that this would be the path I pursue. However, when I enrolled for my first neuroscience course, I discovered a new and profound passion for understanding the complexities of the human brain and how cognitive abilities are impacted by various diseases. As I delved deeper into the subject matter, I found myself drawn to the cutting-edge research being conducted at the intersection of neuroscience and engineering. My college experience has provided me with unparalleled opportunities to explore these fields, and I made the decision to pivot my academic focus from biology to the realm of neuroscience and bioengineering. An aspect that particularly attracted me to research in this area was the study of disease progression. I was captivated by the profound impact that neurological disorders, such as Parkinson's disease, have on individuals. Consequently, I became determined to contribute to the field by actively participating in research aimed at unraveling the mysteries surrounding various neurodegenerative diseases and developing innovative approaches to treatment.

I am thrilled to work at NASA, where I will have the opportunity to put my research capabilities to the test. Being a part of this organization is everything because it not only allows me to explore my interests further, but also provides a platform to collaborate with brilliant researchers in the field of biological sciences. It is an exhilarating prospect, and I am eager to make meaningful contributions in the quest for a better understanding of neurological disorders. I hope to learn many new skills through my time here and dive deeper within the research field that I am so passionate about.

Johns Hopkins University

Major: Biomedical Engineering, Computer Science

PI: Lauren Sanders

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Brian Evarts

Project: AI/ML modeling platform for space biology open science data repositories

Like most children, it all started with Star Wars, Space LEGO and a love of exploring the woods, especially muddy, aquatic environments. My childhood consisted of catching snakes, salamanders and crayfish, building model airplanes and model rockets, designing makeshift parachutes and rappelling devices, then testing them by jumping from a tree or the roof of my house. I forgot to mention, I loved taking things apart, there was not a clock, doorknob, or electronic device that was safe from sudden, unplanned disassembly by my hand.

As the son of a math teacher, it became apparent that I had no choice but to work hard in math and sciences. Luckily, I enjoyed it. During grade school I gained an interest in programming computer games, which later lead to a Bachelor's Degree in Computer Science. Having a love for education and science, I was soon back in school to study for a degree in computational biology, however this turned into an Interdisciplinary Master's Degree in Complexity Science, which focuses on computational modeling of complex systems using networks, agent-based models, machine learning and non-linear system dynamics models. It was during this time that I became very interested in biological complexity and joined a startup company that focuses on algae biotech solutions to research biofuels and waste remediation before pivoting to biopharmaceuticals. I realized that I had a passion for algorithms, complex systems and bigdata, especially biological and genomics data, as that is about as complex and multidimensional as it gets.

Since childhood, I always had this fascination with space and wanted to get involved. In the Spring of 2021, I had come across a social media announcement for the analog astronaut mission SIRIUS-21 and I applied. This was a joint analog mission between NASA, Roscosmos, ESA, and the UAE Space Agency. To my surprise I was selected as a backup crew member and traveled to Moscow, Russia for 2 and a half months to train for the SIRIUS-21 mission. The mission's purpose was to investigate the physiological and psychological effects of long-term isolation for long duration space travel. I participated in over 70 experiments and realized that from that point forward, I wanted to be involved in human space flight.

I am currently a practicing data scientist in addition to being enrolled at Johns Hopkins University in the Applied Biomedical Engineering Master's Program. I have a strong interest in studying human performance and the effects of long duration space travel on biological systems. In my free time I enjoy reading, the outdoors, rock climbing, playing my guitar and mentoring cadets as an Assistant Aerospace Education Officer in Civil Air Patrol.

I am very excited to continue my journey at NASA in the SLSTP Program. I feel incredibly fortunate, humbled and excited to help make my contribution to the science of human space flight and to NASA's very important mission to explore the cosmos and everything in it, and to also apply those discoveries to improve life in our little corner of the cosmos. Ad Astra!

University of Vermont

Major: Molecular Genetics

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Katarina Lile

Project: Human Airway Responses to Simulated Spaceflight Stressors

Space has always been a subject of fascination for me ever since first visiting the National Air and Space Museum. Growing up near Washington D.C. allowed for me to continue to visit throughout my childhood, which only increased my interest in this field. However, I have also become extremely passionate about genetics.

My passion for genetics – and in particular, genetic diseases – truly started in high school, where my combined interest of math and science led me to the biotechnology program at a magnet high school in my county. This program gave me the opportunity to be introduced to the science behind genetic diseases as well as learn wet lab skills. By taking a variety of classes, it also allowed me to explore how a scientist can make a difference in the world. Genetics stands out to me because of its limitless possibilities that can lead to breakthrough innovations of disease prevention and treatment strategies that can save lives and improve the quality of life for many people, reinforcing my aspiration of making an impact in the medical field. This led to my decision to pursue an undergraduate degree in Molecular Genetics at the University of Vermont (UVM).

As a second-year Honors College student at UVM, I have further developed my passion for science through several research opportunities. Since my first year, I have been an Undergraduate Research Assistant in the Krementsov Laboratory at the University of Vermont. The Krementsov Laboratory is an immunology lab with a focus on the molecular mechanisms underlying the pathogenesis of immune-mediated and infectious diseases, specifically that of multiple sclerosis (MS), with much of the research conducted using different mouse models. My role has primarily been investigating the role of the microbiome on MS susceptibility. I was extremely excited to even be a part of a publication in 2022. My participation in this laboratory is giving me an exceptional experience and I will look forward going back when I return to UVM.

I balance my studies with many extra-curricular activities including playing ice hockey, hiking, swimming, and skiing. I also love to read, draw, crochet, bake, travel, and spend time with my dog and the cows on campus. In the fall after the SLSTP internship, I will be studying aboard at the University College Dublin in Ireland. I am excited to study with students from around the world, be immersed in a different culture, learn about my heritage, and be able to see the sights of a country I have never visited. Upon my return, I will use my experiences to start my senior honors research project and prepare for graduate school.

Though I have chosen to pursue genetics in college, it has always been an ambition of mine to find a career where I can study both biological and space science. Revisiting the Udvar-Hazy Center and seeing Kate Rubins' exhibit has inspired me to continue pursuing this dream and has led me to NASA's SLSTP program.

I look forward to this internship as it will expose me to new areas of research and innovative concepts, allow me to develop and learn new skills, and provide experience that will help prepare me for any future career endeavors. I am so excited to be a part of NASA's SLSTP this summer and am extremely grateful for this opportunity!

Tufts University

Major: Biological Science, Computer Science

PI: Jessica Lee

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Nathan Moreno

Project: Microbial Communities in Microgravity

Growing up, I was constantly immersed in nature. My town's forest reservation was my playground and it was there that I first investigated the complexity of life, wondering how the creatures I saw lived and sustained themselves. During summer breaks, I would visit my mother's rural village in Portugal, where I came to realize the interdependence of all living things– including us. Exploring the mountains that sustained my family and seeing how the health of the farms and natural world depended on one another reinforced the notion that humans are part of a fragile and complex ecosystem.

My interest in biology grew and so did my interest in space and science fiction. My imagination was captured by possible futures and images of a universe full of life. When I learned about synthetic biology in high school, my mind was opened to the possibilities of life as a means of engineering and science fiction guided my curiosity to its applications in space exploration and the possibility of using biotechnology to mimic the ecosystems that support us on earth, making self-sustaining environments for space.

In college, I have further developed an interest in computation and how it can be used to assist biological research, and I am now pursuing a degree in Biology and Computer Science at Tufts University. I have had the privilege to participate in a mentorship program that focused on artificial intelligence and its applications for biology research where I learned about research practices and developed a presentation on what deep learning algorithms could be used for bioimage segmentation and predicting pattern formation in living organisms using maps of non-neural voltage. Additionally, I participate in a lab that focuses on computation in biology and its emergent properties, where I am supporting a project in machine learning.

In the future, I hope to work on synthetic biology research and apply that research to space travel and exploration. I am extremely grateful and excited for the opportunity to develop myself as a researcher and take a step towards realizing my goals with the help of NASA's SLSTP this summer!

Pennsylvania State University

Major: Biological Science

PI: Janani Lyer

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Anisha Prabu

Project: Sex-specific physiological and transcriptomic CNS responses to combined effects of spaceflight stressors in Drosophila

I was first introduced to science through my father spending my snow days and summers in his lab. I let my imagination run wild, pretending I was finding the cure to cancer, when in reality I was looking at water under my toy microscope. Watching NOVA documentaries on PBS and reading countless books only fueled my love for biology and understanding the human body.

In 6th grade, I attended a pre-med summer camp where I thoroughly enjoyed my time dissecting organs and putting together pieces of medical mysteries with my peers. My mind was made up: I wanted to be a doctor. For the rest of my high school career, I focused on the path to becoming a doctor, which led me to take anatomy in my junior year. Through my anatomy class I learned about a program at my high school which paired high school students with Penn State faculty to expose them to research. I decided to apply and was ecstatic when I was accepted.

I began working with Dr. Santhosh Girirajan studying the phenotypic variability in the 16p12.2 genetic deletion. I got to assist on projects understanding the sex-bias in autism using a Drosophila model and expanding and culturing induced pluripotent stem cells to understand morphological differences in children with the deletion. Most impactful however, is the translational aspect of my research. I have had the opportunity to work with families around the world educating them on genetic disorders and helping them get access to critical resources for their children. Being exposed to research has motivated me to pursue an MD/Ph.D.in my future.

As a rising junior at Penn State pursuing a Bachelor in Science in Biochemistry and Molecular Biology, I decided to apply to The SLSTP to diversify my research skills and apply my unique experiences to my project. I am excited to strengthen my fly husbandry skills working more with Drosophila this summer and expose myself to a myriad of new opportunities. When I'm not in school, you can find me giving tours of Penn State's campus, teaching chemistry recitations, running rehearsals for Fanaa, Penn State's South Asian acapella team, or reading with a cup of coffee.

University of Arizona

Major: Biological Science

PI: Mark Settles

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Kristen Saban

Project: Space Algae II Pre-flight Testing

The stars were never a large part of my life growing up. Born and raised on Long Island, New York, the light pollution often made it hard to see them at all. I instead turned my interest towards the natural world around me. I spent my time outdoors – digging in the dirt, collecting leaves from the trees and algae from the beach, and intently watching how the critters in my backyard behaved and interacted. I was relentless in bombarding everybody around me with questions about these things – what is dirt really made of? why are the leaves different shapes? how could the birds fly? I am indebted to my parents who fully embraced these questions, and I soon had a beginner microscope and a large stack of biology and chemistry textbooks. With access to these new tools and resources, however, my curiosity only grew. My days were dedicated to biology, but my nights were dedicated to science fiction and the space sciences. Star Wars movie marathons with my family and inhaling Ray Bradbury stories under the covers past my bedtime got me thinking about what it would actually be like to live in space, to colonize new planets. For much of my life, I saw no connection between my interests in space and biology.

It was not until I started my studies at the University of Arizona that I learned how I could reconcile the two. Following my love for biology, I am currently a student in Ecology and Evolutionary Biology (EEB), with minors in Sustainable Built Environments (SBE) and French. Through my time in the EEB department, I've had the incredible opportunity to conduct research as part of the Wiens Lab. There, I research macroevolution of tetrapods and niche conservatism using a phylogenetic approach. This research, along with the many wonderful courses I've had the opportunity to take, has deepened my interest in biological research and ecosystem balances. Further, my studies in SBE have informed my understanding of how people interact with and utilize the space around them. My interests in both the biological science and the built environment have melded into a passion for how people can live and thrive within ecosystems, whether naturally occurring or artificially constructed.

I was gratefully able to explore these interests further through my time as an intern with the NASA Arizona Space Grant Consortium, where I was exposed to the more direct intersections of life sciences and space. I had the privilege to spend a week at the Biosphere 2 facility in Oracle, Arizona. Though now mainly used for climate change research, Biosphere 2 was originally constructed as a closed and self-sustaining ecosystem designed to support human life, similar to what one might expect for future off-world habitation. My time at Biosphere 2 introduced me to the field of environmental control and life support systems. I soon grew a specific interest in how we may transition from mechanical life support systems to bioregenerative or closed-ecosystem ones, especially pertaining to longer duration spaceflight and habitation beyond low earth orbit. I was then fortunate enough to gain first-hand research experience in life support systems in space through my time as an intern at the NASA Marshall Space Flight Center. There, my research focused on microbe and biofilm growth in water recovery systems for use on the ISS.

I am beyond excited to explore the intersections of biology and space science further as a research associate in the Space Life Sciences Training Program at the Ames Research Center! I greatly look forward to the opportunity to cast my taxonomic net wider through research on Space Algae Pre-Flight Testing and to collaborate with incredible mentors and peers this summer. Following this summer, I hope to finish my undergraduate studies and pursue a graduate degree and research position in the field of bioregenerative and closed-ecosystem life support systems. Outside of research and academics, I am an avid language learner, crocheter, hiker, gardener, and consumer of science fiction. So in the meantime, you can still find me outside – digging in the dirt, collecting interesting leaves, and enjoying Ray Bradbury without a bedtime to worry about.

North Carolina State University at Raleigh

Major: Bioengineering

PI: Josh Alwood

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Abdullah Shahid

Project: Data Science and Bioinformatic analyses of model organism studies simulating spaceflight

My passion for engineering was ignited during my early fascination with Formula 1 racing and automotive competition. Unlike many enthusiasts who focus solely on the drivers, I found myself captivated by the engineering prowess of the winning constructor and the team behind the fastest car. This enthusiasm led me to immerse myself in engineering fundamentals, and I vividly recall spending countless afternoons in middle school experimenting with mini wind tunnels and testing various plane models. As my curiosity grew, I delved into resources such as the Glenn Research Center's page on aerodynamics and physics for kids, constantly seeking to understand the mechanics of flight and rocket propulsion.

Throughout middle and high school, my interest in engineering remained unwavering. I dedicated my afternoons and summers to constructing battle bots and underwater remotely operated vehicles (ROVs) for state competitions. As I completed the required coursework for high school, I seized the opportunity to explore new subjects during my two years of dual enrollment at a local college. Coursework in introductory biology and scientific computing/machine learning developed my interest in combining traditional scientific research and computer science.

When I entered college, biomedical engineering seemed like a no-brainer. I would be able to learn in-depth topics in medicine and biology and draw upon my experience in engineering and programming. Along with taking courses in computational modeling, signal processing, and biomaterials, I also studied biochemistry and advanced microbiology. As I continue into my junior year, I strive to learn as much as possible within the fields of engineering, computer science, and biology.

In addition to my coursework, I have had transformative opportunities to gain immense research experience in bioinformatics and computational science. During my freshman year, I researched computational discovery methods of RiPP natural product biosynthetic pathways in the Chekan Lab. There, I experimented with different programs to implement a bioinformatics-first approach to identify gene clusters that encode RiPP natural products. Finding natural products for therapeutic uses is a time-intensive process, but an informatics approach allows for much faster detection. Fueled by this concept, I sought further opportunities to use data science and programming skills to solve traditional scientific problems. In my most recent research endeavor, I am working alongside Dr. Diana Gentry's lab at NASA Ames Research Center, investigating biosignature information to help create a binary classifier for life detection missions. The project uses terrestrial data available from various systems to train machine learning algorithms to classify biosignature information of other samples as biogenic or abiogenic based on features such as Raman spectra, isotopic fractionation, and elemental abundance. Additionally, the algorithms help determine which features are most important for life-detection missions. The overall concept of using an objective algorithmic method to understand the distinguishing properties of life was not only scientifically fascinating but also incredibly inspiring to me as it holds the potential to answer many questions we have about the universe.

My experiences as a student researcher, aspiring engineer, and programmer allow me to delve into many different topics. As a current biomedical engineering student, I see my coursework and experiences as extremely versatile and applicable to many fields. NASA, as an agency, mirrors this in my opinion, where research interests are multidimensional, ranging from space biology to astrophysics. Therefore, I am excited to learn and grow from the SLSTP experience, where I will be analyzing model organism studies during spaceflight using bioinformatics and data science techniques.

My plan for the future is to leverage my skills to solve important problems in medicine and biology using informatics and engineering. I look forward to conducting research in the field of biomedical engineering and bioinformatics and pursuing further education in those sectors after graduation

Sophia Tsekov

University of Massachusetts-Amherst

Major: Biomedical Engineering

PI: April Ronca

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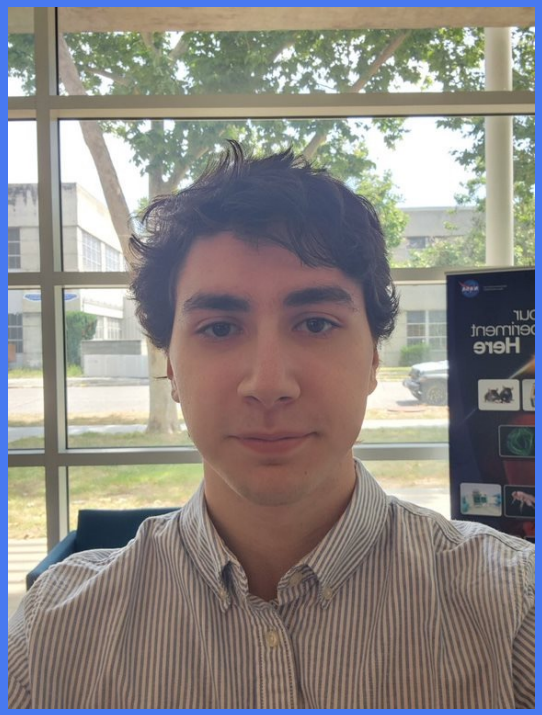
Project: Sex-specific Response to Ionizing Radiation on Rodent CNS

I'm a rising senior studying biomedical engineering at the University of Massachusetts Amherst. As an undergraduate, I've had the opportunity to work in an on-campus lab specializing in neurobiological interfaces. My focus has been on developing multifunctional neural probes that utilized optogenetics to aid in spinal cord injury recovery. Additionally, I've been involved in various projects related to neural modulation, magnetic field-controlled drug delivery, and glaucoma research.

Outside of university, I worked in a neuroscience lab at Boston Children's Hospital, specifically in the critical care unit. There, I conducted research on the impact of analgesics on the developing infant brain. This year, I'm excited to delve deeper into clinical research by collaborating with UMass engineering and nursing faculty on an interdisciplinary study. Our aim is to implement an individualized blood pressure management system in local community health centers.

Looking ahead, I'm eager to explore the intersection of neuroscience, healthcare, and space life sciences. The SLSTP program offers an exciting opportunity for me to immerse myself in this new field of research and potentially shape it into a future career. By combining neuroscience and space exploration, I hope to contribute to our understanding of the human body in space, pushing the boundaries of scientific exploration and its applications both on Earth and beyond.



University at Buffalo

Major: Biomedical Engineering

PI: Diana Gentry and Jessica Lee

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Dylan Walsh

Project(s): Automated microbial culture instrumentation testing and characterization (50%), Microbial Life, Death, and Stress in Space (50%)

My journey through the world of science and engineering can only be described as erratic. I first became interested in biomedical engineering topics at a young age. It was in 2011 when I first read a paper on CRISPR-Cas9. I read about it in a children's science journal, and the potential of the technology blew my 12-year-old mind. I became interested in science from that point onward until my focus shifted again in high school.

By the time I was declaring my college major in Junior year, I was keen on developing neuroprosthetics. Brain-computer interfaces seemed like the future, and I wanted to be a part of that research. I took courses during my sophomore and junior years of undergrad on interfacing deep learning and the brain. There is a lot of great research in the field neuroprostheses but as I learned about deep learning and computer vision, I shifted interest to Medical Imaging. I took more courses on medical imaging modalities and machine learning for biomedical data during my senior year of undergrad. My senior design project was to develop and object detection model for creating regions of interest in neuro-interventional X-Ray images. The model could locate and identify interventional devices such as catheters, stents and wires with upwards of 90% accuracy. These regions of interest would allow for collimation during a procedure to become automated and would decrease patient dosage.

After I graduated, I interned at NASA Ames Research Center in Fall 2022. I worked on a ground support instrument for BioSentinel. My project was to optimize an optical probe design that could create optical data comparable to that of the flight unit's optical data. This would allow for the additional sensors of the ground unit to be mapped onto the flight unitculture. Mapping of the additional sensor data enhances the overall science return. Working in the Space Biosciences building at Ames exposed me to many great scientists and engineering and has piqued my interest in the field of Space Biology. I enjoyed the collaborative atmosphere in the Biosciences building at Ames and I am excited to return to Ames as part of the Space Life Sciences Training Program.

University of Michigan-Ann Arbor

Major: Biological Science

PI: Siddhita Mhatre

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Tommy Wyniemko

Project: Sex-specific CNS responses to gravity as a continuum in Drosophila

For as long as I can remember, I have been enthralled with all things related to space science and exploration – I would track every rocket launch, meteor shower, and new Neil deGrasse Tyson book like an obsession. The idea of 'space' was a window into something so vast and enigmatic, so knowingly unknowable – the unwritten and unanswered questions beckoned me to learn. Even now, when I look into the night sky, I find that this expanse is saturated in ontological insight and inspiration. Given how humans have been wanderers since our beginning, space commands our evolutionary imperative to be discovered and known – and I wish to be as much a part of it as I can!

Whilst growing up in China, I had the chance to volunteer regularly at an orphanage for the lesser-abled. I absolutely loved to work with these children, and saw, throughout my years, the incredible help that occurs through medicine and research. I was enthralled with the treatments and studies performed by the visiting doctors, and grew even more invested when I saw the amelioration of the children I cared for. Seeing so personally the power of careful research and clever application, I knew I had found a calling.

As I enter my junior year at the University of Michigan as a biology major, I've been lucky enough to work these passions into reality through both my academic research and other endeavors.

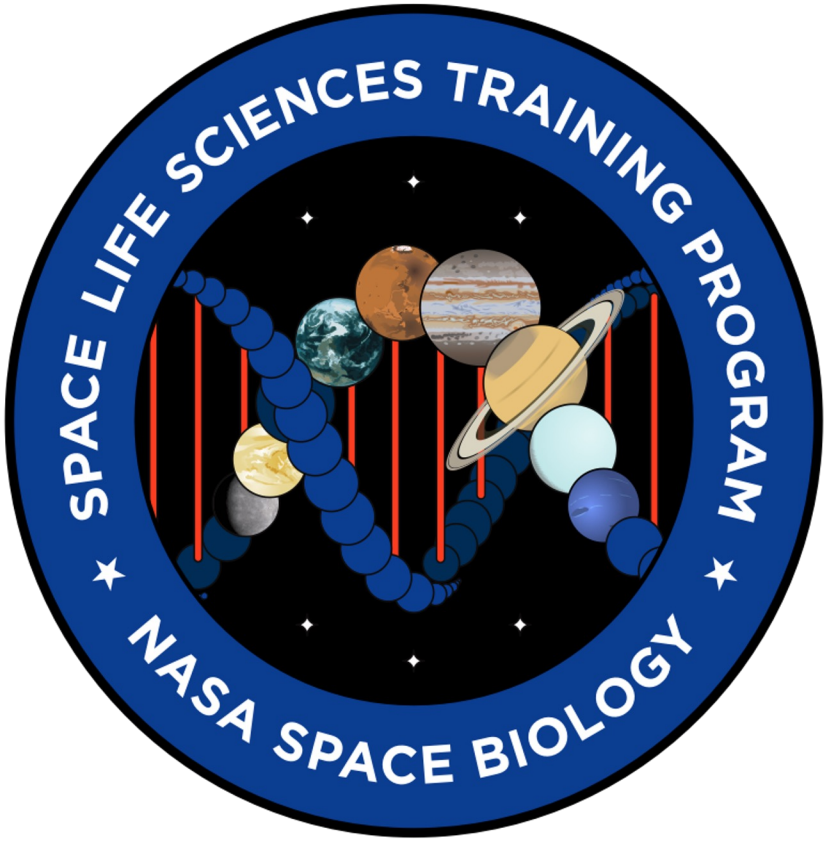
I currently work in establishing Michigan Space Medicine, which is a new collaborative research vehicle of the medical and engineering schools targeted towards advancing interplanetary exploration. Via inter-departmental research, innovative application, and collaborative engagement, we hope to work towards our future in space!

I also conduct research at Michigan Medicine under the Dr. Dawen Cai lab and Dr. Ye Li, where I am probing new questions through the development of BitBow, a neuronal lineage tracing tool that utilizes multi-color transgenics and a combinatorial binary design as a labeling method in the Drosophila nervous system. I've since worked in establishing serotonergic hemi-lineage independence, and have recently begun a project utilizing single-cell RNA-sequencing combined with past data to track the underlying cell-specific products of serotonergic neuronal lineage development.

I am honored to be a part of SLSTP at NASA – working at the intersection of space exploration and biology is a dream, and I cannot wait to get started!

Outside of academia, I absolutely love the outdoors, sunshine, trying new foods, reading, and most especially travel – Some notable trips include traveling on motorbike from the south to the north of Vietnam, trekking in the Indian Himalayas, and seeing rural Romania!

2023 Mentors



Research & Project Scientist, Space Biosciences Research Branch

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Josh Alwood

Research and Project Scientist in the Space BioSciences Research SCR Branch, focusing on bone biology and biomechanics, reproductive biology, and the nervous system. He has served in the past as a Project Scientist for Space Biology and currently serves as a Project Scientist for the Human Research Program, focusing on translational and interdisciplinary science. He's also an Ames Center Rep for the Transition to Open Science (TOPS) Program.

Research Scientist, Space Biosciences Research Branch

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April Ronca

April E. Ronca, Ph.D. is a scientist in the Space Biosciences Research Branch and Adjunct Professor Obstetrics & Gynecology, and jointly, Neurobiology & Anatomy, Molecular Medicine & Translational Science, and the Center for Biomolecular Imaging at Wake Forest School of Medicine. Dr. Ronca has published over 80 peer-reviewed publications, has been awarded grant funding from the National Institutes of Health (NIH) and NASA, and served on the NIH Biobehavioral Regulation, Learning and Ethology Study Section from 2009 to 2013. Dr. Ronca was an investigator on two spaceflight experiments jointly sponsored by the NIH and NASA (NIH.R1 and NIH.R2), the first in which pregnant mammals were flown on the space shuttle. Her work has been featured on the *Science Discovery Channel*, and she was interviewed for the *History Channel Universe* segment on 'Sex in Space'. In 2004, she was honored with the *Thora W. Halstead Young Investigator Award* and the NASA Exceptional Achievement Medal. Dr. Ronca has served on numerous federal review panels and working groups, including the National Academy of *Sciences Animal and Human Biology Panel for the Decadal Survey on Biological and Physical Sciences in Space*. She serves on the Editorial Boards for Gravitational & Space Research, Life in Space Research, and Developmental Psychobiology. From 2009-2013, she was Director of the Women's Health Center of Excellence Research Program at Wake Forest School of Medicine, a position through which she established new translational research initiatives in sex/gender biomedicine. In 2013, she Co-Chaired the NASA Headquarters Review of The Role of Sex/Gender in Adaptation to Spaceflight: Reproduction, coincident with the first NASA Astronaut Class comprised of 50% women (2013).

Research Scientist, Space Biosciences Research Branch

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Mark Settles

Dr. Settles is a Research Scientist in the Bioengineering Branch of the Space Bioscience Division. He received a B.S in Biological Sciences from the University of Delaware, and a Ph.D. in Genetics from Stony Brook University. He completed his dissertation research at Cold Spring Harbor Laboratory with Rob Martienssen and a post-doc at the University of Florida with Don McCarty. From 2000-2021, Dr. Settles was the Vasil-Monsanto Professor of Plant Cell and Molecular Biology at the University of Florida. His UF program focused on mechanisms of maize seed development, NIR spectroscopy, computer vision, and testing biotechnology applications from his basic research program. While at Florida, Mark served as the Graduate Coordinator and Director of the Plant Molecular and Cellular Biology graduate program. He also was a visiting professor at the Federal University of Viçosa in Brazil and Shandong University in Jinan, China where he taught short courses in plant genetics and developmental biology. In 2020, Dr. Settles became a Program Director for the Plant Genome Research Program at the National Science Foundation.

Dr. Settles first got involved in space biology research in 2017 as the principal investigator of the Space Algae flight experiment on the International Space Station. He was also a test subject for the NASA Human Exploration Research Analog where he completed a 45-day study on deep space exploration risks with three other crew members.

Dr. Settles joined NASA Ames in 2021 to become a Space Synthetic Biology investigator. He is currently the principal investigator of the Space Algae-2 ISS flight project as well as the Lunar Explorer Instrument for space biology Applications (LEIA) project. LEIA is scheduled to be the first Commercial Lunar Payloads Services (CLPS) biology experiment conducted on the surface of the Moon. Dr. Settles recently initiated a project with NASA's Convergent Aeronautics Solutions program to investigate biological and bioinspired adhesives.

Research Scientist,
Biospheric Science Branch
NASA *Ames Research Center*
Moffett Field, California

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Diana Gentry

Dr. Diana Gentry, originally from Yonkers, New York, came out to the SF Bay Area for college, studying mechanical engineering at Stanford University. She was introduced to NASA Ames Research Center through an internship with the GeneSat project, a miniature satellite program designed to study microbiology in space. The arrangement proved mutually agreeable, and she stayed to receive a Ph.D. while working as part of the Ames Graduate Cooperative Program, demonstrating a manufacturing method for structural biomaterials using 3D-printed arrays of genetically engineered cells. She has been a full-time researcher at NASA since 2015 and is now a co-director of the Bioengineering & Instrumentation Group (BeING) Lab and the director of Ames's Aerobiology Laboratory. Her current projects at NASA Ames focus on 'top down' approaches to studying complex, emergent biological systems, including developing an optical/biofluidics system to detect small changes in microbial cultures for small satellite, ISS, and lundar lander missions; machine-learning-directed experimental evolution of microbial cultures; modeling the distribution and variation of Mars analogue biosignatures; and studying the spatial and temporal distributions of microbes in cloud and fog water as a potential analogue for Venus. Dr. Gentry describes herself as a "professional wearer of many hats", bridging science and engineering to discover new ways of addressing questions in astrobiology, space biology, and bioengineering. She has hosted interns from a number of NASA student programs, as well as co-advising master's and Ph.D. students at nearby universities, and is excited to host this summer's SLSTP cohort.

Research Scientist, Space Biosciences Division

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Jessica Lee

Dr. Lee's research interests span the breadth of Space Microbiology, and she uses both wet-lab experimentation and computational modeling to understand what microbes really experience when they come to space with us. How do they feel space stresses like microgravity and radiation, and how is that different from what multicellular organisms experience? What is the fate of the microbes that hitchhike on space hardware? How can we use our knowledge of microbial ecology to ensure healthy built environments for human explorers? How can we use microbes to produce food and medicines to support deep-space exploration, while ensuring those products are safe to consume? At NASA she is a project scientist supporting biological research beyond Low Earth Orbit, contributes to an effort to catalogue and archive all of NASA's microbial isolates, and is keen to further microbial bioinformatics education through NASA GeneLab. Dr. Lee completed her S.B. in Biology at MIT, followed by two M.Sc. degrees at the University of Oxford, one in Biodiversity and one in Integrated Biosciences. She then completed a Ph.D. in Earth System Science at Stanford University, focusing on the ecology of nitrogen-cycling bacteria in San Francisco Bay. She has also studied methylotrophic bacteria as a postdoctoral researcher at the University of Idaho, and microbial phenotypic heterogeneity and evolution as a postdoc at San Francisco State University. She has been working at Ames since 2020.

Staff Scientist at Blue Marble Space Institute of Science

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Lauren Sanders

Dr. Lauren Sanders is a staff scientist with Blue Marble Space supporting the NASA GeneLab project as the acting project scientist. She is also involved in leading the Artificial Intelligence for Life in Space (AI4LS) working group. This work focuses on using artificial intelligence, machine learning, and space biological data to characterize risks to human health from spaceflight travel. Dr. Sanders holds a Ph.D. in Biomolecular Engineering and Bioinformatics from UC Santa Cruz, where her thesis focused on multi-omic analyses of cancer data and 3D organoid research on the developmental origins of pediatric brain cancers..

Sergio Santa Maria

Research Scientist, Space Biosciences Division

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Dr. Sergio Santa Maria is a Research Scientist in the Space Bioscience Division at NASA Ames Research Center in Moffett Field, CA. His research interests are in the areas of DNA damage repair, space radiation, and biosensor technologies. He is currently the Lead Project Scientist for NASA's BioSentinel mission, a 6U nanosatellite that flown as a secondary payload on NASA's ARTEMIS-1, launched in November 15th, 2022. He is responsible for the development of the space radiation biosensors that will be used in BioSentinel and for testing and validation of the biosensors using different ionizing radiation sources, including particle accelerator experiments at the NASA Space Radiation Laboratory at Brookhaven National Laboratory and the proton accelerator facility at Loma Linda University. Additional projects involve the development of new biosensor technologies using dielectric spectroscopy and adaptive evolution studies under simulated microgravity. He earned his Ph.D. in Biochemistry and Molecular Biology from The University of Texas Medical Branch in 2008 and continued his postdoctoral studies at New York University School of Medicine as an American Cancer Society Postdoctoral Fellow from 2009 to 2013. He started working at NASA Ames Research Center in 2014.

Research Scientist, Space Biosciences Division

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Stephanie Puukila

Dr. Stephanie Puukila received her HBSc in Applied Biomolecular Science, MSc in Biology and PhD in Biotechnology in Medicine from Lakehead University, Thunder Bay, Ontario investigating models of oxidative stress and dietary antioxidant countermeasures. She followed this with postdoctoral research at Flinders University, Adelaide, Australia investigating the effects of low dose radiation exposure on pulmonary and immunology systems. She first joined NASA Ames as a NASA postdoctoral program fellow investigating the combined effects of spaceflight-like stressors. She continues this research as a Research Scholar with Blue Marble Space Institute of Science at NASA Ames. Specifically, she analyzes spaceflight induced oxidative stress responses and the resulting behavioral deficits with the aim to develop and test antioxidant countermeasures. She is also an investigator on Rodent Research 20, studying the effects of female fertility on mice that have been experienced spaceflight on the ISS, and is a member of Dr April Ronca's research team for Rodent Research 26.

Postdoctoral Researcher
NASA Postdoctoral Program
Space Biosciences Division,

NASA Ames Research Center, Moffett Field, California

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Piyumi Wijesekara

Dr. Piyumi Wijesekara is a postdoctoral researcher in the Radiation Biophysics Laboratory, Space Biosciences Research Branch at NASA Ames Research Center. She is a multidisciplinary researcher with experience in tissue and organ engineering and regenerative medicine. She received her B.S. in Bioengineering from the University of California San Diego in 2015 and her M.S. and Ph.D. in Biomedical Engineering from Carnegie Mellon University in 2017 and 2022, respectively. While pursuing her Ph.D. at Carnegie Mellon University, she focused on stem cell and organ engineering, with a particular emphasis on lung engineering, to investigate human respiratory pathophysiology.

Her main research interest at NASA Ames Research Center includes developing technologically advanced, high-throughput, and three-dimensional human tissue models for investigating the effects of spaceflight stressors, such as ionizing radiation, lunar regolith, microgravity, and high CO_2, on the human respiratory system with the eventual goal of applying them to ensure the health and safety of astronauts during lunar and Mars missions.

Research Scientist
Space Biosciences Research

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Janani Iyer

Dr. Janani Iyer is a research scientist at USRA working in the Space Biosciences Research Branch at NASA Ames Research Center. Her research focuses on the acute and longitudinal CNS responses to different spaceflight stressors, including altered gravity, radiation, isolation, and elevated carbon dioxide using model organisms such as fruit flies and mouse. She is currently an co-investigator in an invertebrate spaceflight study focused on integrated physiological responses of CNS and muscle in *Drosophila* and *C. elegans* along a gravity continuum. She is also a principal investigator in a ground based *Drosophila* study to understand the sex-specific physiological and transcriptomic CNS responses to combined effects of altered gravity and elevated carbon dioxide.

Dr. Iyer received her B.S. in Biochemistry and M.S. in Genomics from India. She completed her PhD in genetics from Pennsylvania State University, followed by postdoctoral work focused on understanding the genetic basis of neurodevelopmental disorders.

Senior Project Scientist,
Space Biosciences Research

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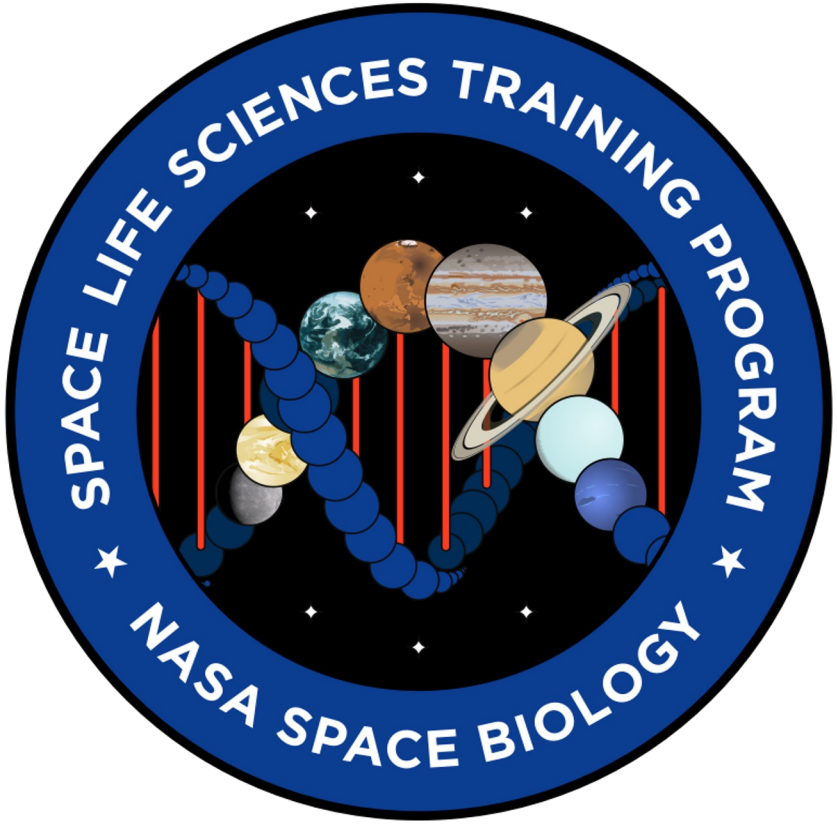
Siddhita Mhatre

Siddhita Mhatre is a Senior Project Scientist at NASA Ames Research Center. In this role, Dr. Mhatre is investigating the role of various space stressors on the physiology of the nervous system and potential countermeasure targets using the *Drosophila* and murine model systems. She has served as a project scientist for the MVP-FLY-01 mission. Dr. Mhatre received her Bachelor's in Pharmaceutical Sciences from the Institute of Chemical Technology, Mumbai, followed by a Ph.D. in Neurobiology from Drexel University, focusing on modeling Alzheimer's Disease in *Drosophila melanogaster* for testing pharmacological interventions. During her postdoctoral work at Stanford University, Dr. Mhatre's research was centered on understanding cellular metabolic pathways, such as the kynurenine pathway, and de novo NAD+ generation in aging and Alzheimer's pathology paradigm using murine and human cell models. She joined NASA Ames Research Center in 2018.

2023 Staff & Management



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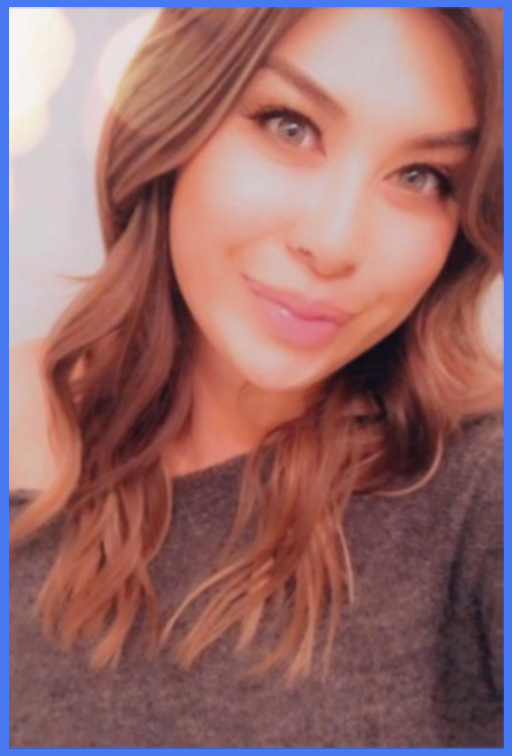

Space Biology Project Coordinator, SLSTP 2023 Program Coordinator

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Kimberly Cadmes

Kimberly is the Space Biology Project Coordinator at NASA Ames Research Center. She provides program and project management support to the Space Biology Project Office and academic programs, GeneLab for High School and Space and Life Sciences Training Program. Kimberly joined Ames in 2016 as a contractor, supporting the Office of the Chief Financial Officer as the Central Travel Office Workload Administrator. She delegated and processed Federal travel orders for Ames Science and Aeronautic Directorates, and Armstrong Flight Research Center deployments. In 2018, she went on to support the Ames Partnerships Office assisting the Patent Licensing team with licensing NASA developed technologies. In 2020, she was a recipient of the NASA Ames Honor Team Award as part of the Technology Transfer Office. Her work was also recognized by the FILMSS contract, and she was presented with a One KBR Award for significantly exceeding established annual performance goals, resulting in widest possible adoption of NASA technologies in the public sector. From there she went to support the Aeronautics Research Mission Directorate as part of the Aeronautics Projects Office Virtual Presence Team. In 2021, she received the NASA Agency Honor Group Achievement Award for her support of the 2021 Transformative Aeronautics Concepts Program Showcase. Kimberly is a detailed oriented individual and is passionate about acquiring new skill sets, improving processes and executing big picture goals. This is her third year supporting the Space Biology branch and she is excited to continue her work with the Space and Life Sciences Training Program.

Space Biology
Project Scientist,
2023 SLSTP Project Scientist
& (Acting) Program Manager

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Stephanie Perreau

Neurobiologist by training, Dr. Stephanie Perreau received a joint PhD from Louis Pasteur University (ULP, Strasbourg, France) and the University of Amsterdam (UvA, Amsterdam, The Netherlands), studying the neuronal pathway controlling the daily rhythm of melatonin in a rat model.
After pursuing her academic career in Germany (Central Institute of Mental Health, Mannheim), studying neurobiology of addiction and its interaction with biological rhythms using various rodent models from 2004-2012, she relocated in California in July 2012. From 2013-2018, Stephanie investigated the impact of alcohol abuse on sleep as a NIH funded Principal Investigator at SRI International. Over the years, she conducted numerous collaborative research studies and led independent NIH funded research projects in the fields of addiction and chronobiology *(alias Perreau-Lenz).*
In July 2018, she redirected her career and joined the NASA Ames Research Center as a contractor (KBR/ Fully Integrated Life cycle Mission Support Services, FILMSS contract) to support the Space Biology Program as a Project Scientist for flight missions.
In the past 5 years, she oversaw the mission science of Rodent Research-10 mission (PI Almeida; bone formation study), led the initial science definition phase of Rodent Research-18 mission (PI Mao; Eye study) and 3 upcoming Rodent Research missions focusing on oxidative stress (RR-21) and reproductive system (RR-20), and Rodent Research Habitat Validation 2 or RR-26, and recently oversaw the successful completion of the international NASA-JAXA Joint Partial-gravity Rodent Research (JPG-RR) Mouse Habitat Unit-8 (MHU-8) mission. The NASA/JAXA joint science mission used the JAXA's Multiple Artificial-gravity Research System (MARS) to study targeting the musculoskeletal system, microbiome, metabolism, and circadian rhythms.
Since September 2021, Stephanie is also a Task Order manager for the FILMSS contract, and, this summer 2023, she took over new responsibilities as Project Scientist & Acting Program Manager of the SLSTP 2023 Program.

Science Manager

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Elizabeth Keller

Elizabeth Keller receiver her BA and MA Degrees from San Jose State University in Neuro-Cognitive Science. She began her career in space-related work when she was hired as an Ames student research scientist in Aerospace Human Factors. She conducted research on astronauts working in low earth orbit. Later she was hired as a Science Associate in the Space Life Sciences Payloads Office where she worked supporting science payload operations for rodent research on the Space Shuttle. She's been back at Ames Research Center since 2012 as a Senior Scientist in the Space Biology project office, where she has supported budget planning for grants, science outreach, program assessment and analytics reporting, science communications, and as the Project Coordinator for the Space Biology ground grants and student research. Elizabeth is also the creator, author and producer of ExtremeScience.com, an online destination that established a new standard for approachable and engaging science education. Her success with Extreme Science got her noticed by the National Geographic Society, which signed her for a book contract. Elizabeth enjoys engaging the public on NASA's missions and inspiring the next generation.

Space Biology Portfolio Scientist
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Jonathan Galazka

Dr. Jonathan Galazka became the NASA GeneLab Project Scientist in 2017, joining the Space Biosciences Research Branch in 2015. Before this, he was a NASA Postdoctoral Program Fellow at NASA Ames Research Center studying the genetic and epigenetic response of yeast to microgravity exposure and a Postdoctoral Scholar in the lab of Dr. Michael Freitag at Oregon State University, where he studied the mechanisms of heterochromatin establishment and the role of heterochromatin in maintaining genome structure. Jon attained his PhD at the University of California, Berkeley in the lab of Dr. Jamie Cate, studying biomass degradation and conversion by filamentous fungi and yeasts at the Energy Biosciences Institute. In his free time, Jon enjoys spending time with his family in nature.

Space Biology Deputy Portfolio Manager

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Matthew Lera

Matthew Lera is currently the Deputy Portfolio Manager for Space Biology and the Manager for the Beyond LEO Instrumentation & Science Series (BLISS) at NASA Ames. BLISS includes the Lunar Explorer Instrument for space biology Applications (LEIA) mission, a Flies & Worms payload on Artemis II, the Beyond LEO Science Working Group, and other deep space hardware capabilities currently in development. Matt began his career at Ames in 2004 as a Research Assistant on the Space Shuttle payload, Fly Immunity & Tumors (FIT), which flew on STS-121 in 2006. He then joined the Small Spacecraft Payloads & Technologies group and served as a Support Scientist for PharmaSat and the Payload & Fluidics Lead for EcAMSat, both microbial cubesat missions. He has also served as Deputy Project Manager, Project Scientist, or Operations Lead on several ISS missions including Fruit Fly Lab-01, -02, and -03, and 3-Dimensional Microbial Monitoring. He was Department Head and Deputy Program Manager of the FILMSS contract before joining civil service in 2021. He holds a BS in Biotechnology/Microbiology from UC Davis and an MS in Biotechnology/Astrobiology from Johns Hopkins University.

Space Biology Portfolio Manager

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Amy Gresser

Amy received her B.S. in Biology from the Massachusetts Institute of Technology with minors in Brain and Cognitive Sciences and in Chemistry. She also holds a Ph.D. in Molecular and Cellular Biology from Harvard University where her research focused on neuronal coding in the rodent vomeronasal system. As a post-doctoral fellow at Cincinnati Children's Hospital Medical Center, she investigated gene regulation in the fruit fly and its role in neurological development and behavior. Amy then spent eight years as a contractor at NASA Ames Research Center where she supported Space Biology as a mission scientist for invertebrate, microbial, and cell biology payloads. In addition, she served as a science and operations lead for Fruit Fly Lab, payload manager for the Synthetic Biology Project's BioNutrients-2 experiment, and a department head for the Fully Integrated Lifecycle Mission Support Services contract. In 2022, Amy transitioned to civil service and is currently the Space Biology Portfolio Manager at NASA Ames. She manages a portfolio of more than 70 active grants focused on development and operations for life sciences experiments that utilize the International Space Station, free-flyer platforms, or ground-based analog systems.