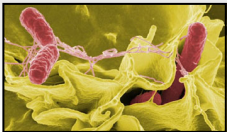


Managing Microbes in Space

This ground breaking research of Principal Investigator Dr. Cheryl Nickerson of the Center



for Infectious Diseases and Vaccinology at the Biodesign Institute at Arizona State University is the first experiment to infect a living organism to study the host pathogen interactions in space in real time. This study focuses on the effects of microgravity on the human immune system by infecting the model organism *C. elegans* round-worm with *Salmonella* pathogen that causes food poisoning in humans. Students will engage in analysis of downlinked videos and submit their data to Dr. Nickerson for possible inclusion in her databases.



Salmonella bacterium



Butterflies in Space



Launched to the International Space Station aboard NASA's mission STS-129 this experiment investigates the ability of "Painted Lady Butterflies", *Vanessa cardui* to "pupate" in microgravity. This activity supports the research of the Butterfly Pavilion at Westminster, Colorado. Students access photos of the space based activity via the Orion's Quest website. They analyze the photos, compare them with classroom outcomes and submit their data to the Principle Investigator.



Monarch butterflies in space-based habitat onboard the ISS



Teacher comments:

"My group tends to be pretty skeptical, and don't really see themselves as a part of anything meaningful. However, this project really engaged them from the start."

April Lanotte
Simla High School

"I wanted to thank you for including my class in the Orion's Quest program. My students really dug into the work and have come away with a better understanding of STEM as a result."

June Tesian
Harper Woods Middle School

"The students had a lot of fun using their skills and academic knowledge to help real scientists work on a real research project."

Chris Lowe,
Seabrook Intermediate School

"Orion's Quest serves as an innovative prototype for academic enrichment and a partnership between NASA and the future scientists."

Betty Hickey
Cocoa High School

Get Your Students Involved

Applications being accepted
for all missions online at:
www.orionsquest.org

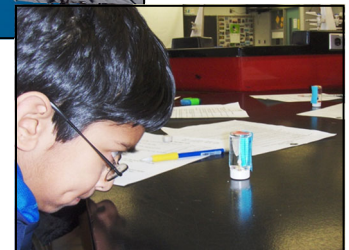
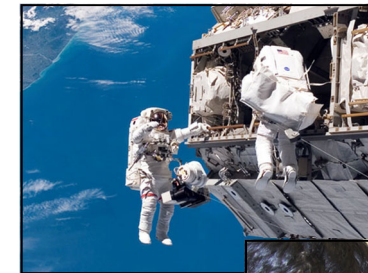
For more information contact
Tom Drummond at
734-546-0556
email: tdrummond@orionsquest.org



Authentic Space-Based Research

Orion's Quest

for today's classroom



Putting NASA in the classroom

About Orion's Quest Missions

All Orion's Quest missions are based on actual research that was or is currently on the International Space Station. We work directly with the Principle Investigator (PI) to engage students in the analysis of downlinked photo or video data. This provides students with an authentic experience and the PI with additional value added data. Listed below are the Orion's Quest mission offerings



- **Biofilms In Space and in You**
- **Butterflies In Space**
- **CuRE Cancer Research Experiment**
- **Fruit Flies in Space**
- **Managing Microbes in Space**
- **Plant Growth in Space**
- **Spiders in Space**
- **STEM On Station**
- **Stem Cell Studies On Station**
- **Worms In Space 2.0 New 2023**

All missions are currently available. For more information about any of these missions go to:

www.orionsquest.org

Mission Statement

The mission of Orion's Quest is to provide teachers with a dynamic hands-on program using authentic space-based research to stimulate in students a lasting interest in the STEM disciplines.

Orion's Quest is a web based program that provides student "missions" for upper elementary, middle and high school classrooms. Missions are:

- Inquiry based
- Short duration
- Based on actual research conducted in space
- Aligned with national science and math standards
- Provided at **no cost** to teachers through the generous support of our corporate partners



*Orion's Quest teacher
Terri McCormick*



Students support NASA research and work for NASA scientists by analyzing photo or video data downlinked from experiments onboard the International Space Station. Classroom results are then sent to the Principle Investigator (PI) for review and database support.



INTRODUCING

Aerogels: Materials Science Study

This research of Dr. Jessica Frick studies the different forms and characteristics of a type of matter called Aerogel. Made of 99% air, yet stronger than steel, Graphene Aerogel may prove valuable for energy storage in batteries, oil spill cleanup and next-generation space suit materials and it's formation in microgravity may improve it's amazing properties and interesting applications.



*Dr. Jessica Frick
Stanford University*

Participating students will support the work of Dr. Frick by learning to use NIH developed software in reviewing proprietary photos and videos from experiments conducted on both the ground and onboard the International Space Station.



Plant Growth in Space

This mission uses the plant species *Brassica rapa* or Wisconsin Fast Plants to shed light on the question, "How do plants react to microgravity in their early growth stages". As humans continue to expand the duration of space flights and the distance travelled from Earth, the need for sustainability in space becomes essential.

Students discover how the phototropic and gravitropic responses of plants grown in a space-based experiment onboard the International Space Station compare with those of plants grown in an Earth-based control experiment.



*Astronaut Satoshi Furukawa
placing Brassica rapa seeds*