

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.



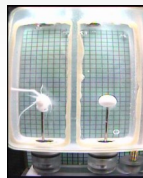
Salmonella bacterium



Silicate Gardens in Space



“Silicate Gardens in Space” is a chemistry based research study that supports the work of crystallographers Dr. Julyan Cartwright, left, and Dr. Ignacio Sainz Diaz in Spain. Using sodium silicate solution and various metal salts, this study is designed to provide new information on the formation and growth of hollow tubes and spheres, the basic structures of chemical gardens, while in a microgravity environment. Students record observations and measurements to evaluate one of several variables as they analyze and compare photographic records from the International Space Station with an earth based control experiment.



Silicate tubes in space-based experiment 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

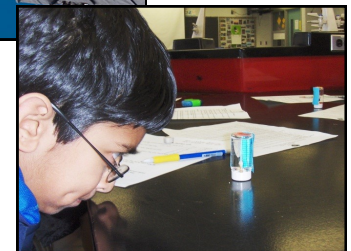
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Authentic Space-Based Research



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 some of the Orion's Quest missions and the name of the Principle Investigator for each. In addition we have highlighted the new **Biofilm** mission and several others on the following pages.

- **Butterflies In Space**
MaryAnn Colley
- **Fruit Flies In Space**
Dr. Sharmila Battacharya
- **Managing Microbes In Space**
Dr. Cheryl Nickerson
- **Plant Growth In Space**
Dr. Nancy Moreno
- **Silicate Gardens In Space**
Dr. Julyan Cartwright
- **Spiders In Space**
Dr. Louis Stodieck
- **STEM On Station**
Dr. Joseph Wu and Dr. Peter Lee
- **Stem Cell Studies On Station**
Dr. Abba Zubair
- **CμRE Cancer Research Experiment**
Dr. Shou-Ching Jaminet
- **Biofilm In Space**
Dr. Luis Zea

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
- Support 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

Biofilm in Space and in You!

In this new mission students work with researcher Dr. Luis Zea who is studying Biofilms in space. Biofilms are groups of bacteria or fungi that stick together and to a surface. Many infectious pathogens use biofilms to become more virulent and resistant to antibiotics. Biofilms form on your teeth, in hospitals and in spacecraft, potentially degrading materials and increasing the risk of disease among astronauts. Participating students will support Dr. Zea by viewing proprietary photos in order to analyze the effects of microgravity on biofilm growth, and to analyze the effects of different surfaces on the growth of biofilms.



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

