

Spiders in space weave a web of scientific inspiration for Spider-Man fans

April 25 2014, by Laura Niles



A female golden orb spider in her web, the same type of spider used in the CSI-05 study that inspired the “Spiders in Space” teacher’s guide.
Credit: Danielle Anthony

While spiders were busy spinning webs in space, researchers on Earth weaved their knowledge of this activity into educational materials to inspire and motivate students. Now, this free, Web-based guide is being re-released through Scholastic and Sony Pictures as curriculum for

educators to leap on the excitement surrounding the release of the film, "The Amazing Spider-Man 2."

For those who may have missed it, this guide's inspiration came from real science using [spiders](#) in [space](#). And although the spiders were exposed to microgravity and radiation in space, they did not morph into mutants; rather, they adapted quite well and provided a biology lesson learned around the world.

Using information gleaned from the Commercial Generic Bioprocessing Apparatus Science Insert-05 (CSI-05) investigation conducted aboard the International Space Station, BioServe Space Technologies, Baylor College of Medicine and NASA developed an educational guide for teachers called "[Spiders in Space](#)." The learning tool was also funded by grants from the Howard Hughes Medical Institute and the Houston Endowment Inc., and previous work supported by the National Space Biomedical Research Institute.

"From an educational standpoint, the fact that a large commercial enterprise was willing to work with science institutions to promote lessons that we know are accurate, have been evaluated and are engaging for students, is really valuable," said Nancy Moreno, Ph.D., professor at Baylor College of Medicine and editorial director of BioEd Online. "To be able to leverage this resource for something like 'The Amazing Spider-Man 2' expands the scope and increases the reach of the project. We hope it generates interest in and enthusiasm for research on the space station by new audiences."

Launched with the STS-134 mission aboard space shuttle Endeavour to the space station in 2011, CSI-05 allowed researchers to observe spiders in a microgravity environment. Two golden orb spiders, or *Nephila clavipes*, were flown aboard the space station in a special habitat. This allowed researchers to study the spiders' web-spinning practices to see if

that behavior or the characteristics of the web they produced would change over time. The habitat's cameras collected imagery throughout the spiders' time in microgravity to document any differences between those in space and the same type of spiders on the ground.

As it turns out, the golden orb spiders' behavior did not change greatly in microgravity. Their webs looked much like webs spun on Earth, though in space the webs were more circular. The research found that the golden orb spiders liked to spin their webs following a timetable, in contrast to orb spiders from a previous investigation who would spin webs at all times of day.

As the spiders spun their space webs, students were able to use the downlinked imagery to compare the space spiders to golden orb spiders housed in their classrooms on Earth. Educators for grades kindergarten through 12 were able to conduct investigations of these spiders in their classrooms in near real time. Thanks to the "Spiders in Space" teacher's guide developed during and following the CSI-05 investigation, this curriculum is still in use.

The free guide is available on the BioEd Online website, which provides a plethora of resources to science educators and is run by Baylor College of Medicine. The guide features background information, lesson plans and student activities for conducting a project similar to the [space station](#) investigation and adapted for the classroom. The goal of the curriculum is to encourage learning and interest in science, technology, engineering and mathematics (STEM). The guide is accompanied by video, including a demonstration of how to set up classroom spider habitats and other classroom resources.

"Spiders and space are two things that capture the imagination of most kids, so it's a recipe for fascinating science in the schools," said Tara Ruttley, Ph.D., associate program scientist for the International Space

Station. "I think this creates great memories for the students, and a way to show them how science can be fun as their science classes become more challenging through the years."

Using this guide, students participate in inquiry-based learning about web spinning and other behaviors of orb weaving spiders on Earth and in microgravity. Students who engage in the scientific process themselves are more likely to be inspired to become the next generation of explorers and researchers. This will likely be their first introduction to an investigation in the space environment and its implications for scientific research. They learn how to conduct a controlled experiment, practice humane animal-handling and experimental procedures, make detailed observations over time and compare their control experiment results to those obtained in the original spaceflight investigation.



A golden orb spider and its web inside the Commercial Generic Bioprocessing Apparatus Science Insert-05 (CSI-05) spider habitat aboard the International Space Station. Credit: NASA

With renewed interest in the "Spiders in Space" guide generated by the film, many more educators and students will be exposed to this valuable research activity. Students around the globe will have opportunities to become scientists in the classroom, inspired by a project that gives them the opportunity to create, study and solve problems.

"We hope to generate an appreciation of the unseen natural world and its importance," said Moreno. "The possibility of students carefully observing the behavior of organisms is a real opportunity. Their ability - based on their own observations - to then ask meaningful questions and collect data to answer those questions helps develop their problem-solving skills."

With promotion through the release of a new Spider-Man film, these "spidernauts" are recommencing their fame. With the "Spiders in Space" guide, educators are recapturing enthusiasm for these arachnids, and their intricate webs will continue to hold fast on students' attention long after the closing credits.

Provided by NASA

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