CU-Boulder space station experiments to involve k-12 students around the globe

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A high-flying K-12 education effort by the University of Colorado at Boulder will feature two science investigations launching on a NASA space shuttle this week and continuing on for extended stays aboard the International Space Station.

A payload carrying a seed germination experiment and a second experiment involving eyelash-sized worms will be launched Dec. 7 aboard the space shuttle Discovery from Cape Kennedy, Fla., said Louis Stodieck, director of the BioServe Space Technologies Center. Headquartered in CU-Boulder's aerospace engineering sciences department, BioServe will downlink video, still images and data from the experiments to its educational partners, who will provide the information and accompanying curriculum materials to teachers working with an estimated 1,000 elementary, middle and high school students in the United States and abroad, Stodieck said.

Some classrooms will track the effects of near zero gravity on the germination of radish and alfalfa seeds orbiting Earth on the space station, comparing the effects to seeds bound by Earth's gravity sprouting simultaneously in their own schools, said Stodieck. Other students will focus on a group of nematodes known as C. elegans that will ride on the space station, with students remotely monitoring. population dynamics, physiology, daily movements and even gene activity, including possible genetic mutations caused by space radiation.

"This is an exciting project for BioServe and a great opportunity to

engage K-12 students in space research," Stodieck said of the payload, called "CSI" by the BioServe team. "We want to help meet teacher educational objectives, but also conduct meaningful scientific research on gravity-dependent biological processes that support NASA's program for the human exploration of space."

BioServe, a NASA Research Partnership Center, will join forces with two educational partners. The seed experiment involves a program called Adventures of the Agronauts at North Carolina State University -- a free, online science curriculum with a space biology theme for elementary students -- while the nematode project involves Orion's Quest, a Web-based education program based in Detroit that works closely with NASA and various schools on K-12 space education efforts, he said.

Since the seeds in space will be sprouting in a translucent, gel-like material, the students will be able to chart root and stem growth, comparing them to seeds sprouted on Earth that orient themselves toward the soil surface in response to gravity. "A seed germinating in the low gravity of space is a bit like a swimmer underwater in the dark who loses all perception on which way is up," Stodieck said.

The nematode experiment is sponsored by the Malaysian Space Agency and will involve an automated growth chamber designed and built by BioServe that will maintain a population of C. elegans, a popular organism in labs around the world whose genome is now fully sequenced by scientists, said Stodieck. High- and low-resolution cameras on the space station will allow scientists and participating middle school and high school students to track changes in population, morphology and movement of the translucent worms on orbit.

"If these nematodes lose muscle mass like astronauts lose muscle mass during space flight, the students should be able to see it in their daily behavior," Stodieck said. "We anticipate the students will be able to do

quite a lot of research on these organisms, some of which should be publishable in scientific journals."

The seeds and worms will fly on BioServe's Commercial Generic Bioprocessing Apparatus, or CGBA, a suitcase-sized payload that has been used to carry out dozens of life science and biomedical experiments. Versions of the CGBA have flown on more than a dozen shuttle missions, and a CGBA delivered to the International Space Station in 2001 is still there.

After the nematode payload is returned to Earth, scientists will be able to look closely at the physiology and genetics of the nematodes, which reach sexual maturity in about a week, he said. The orbit duration of the C. elegans experiment will be more than 10 times longer than any previous nematode experiment in space.

We anticipate being able to look at accumulated genetic mutations over about 30 generations of these organisms," he said. Such organisms could conceivably be used as biological "dosimeters," or devices used to measure exposure to cumulative doses of radiation over time, as NASA prepares for manned missions to the moon and Mars, where space radiation is more severe than in the near-Earth environment, he said.

The Malaysian Space Agency will work with government officials there to involve hundreds of Malaysian high school students in the projects, said Stodieck. Summit Middle School in Boulder also will be participating.

BioServe hopes to launch such educational experiments with NASA on an annual basis, teaming with industrial partners, he said.

Source: University of Colorado at Boulder