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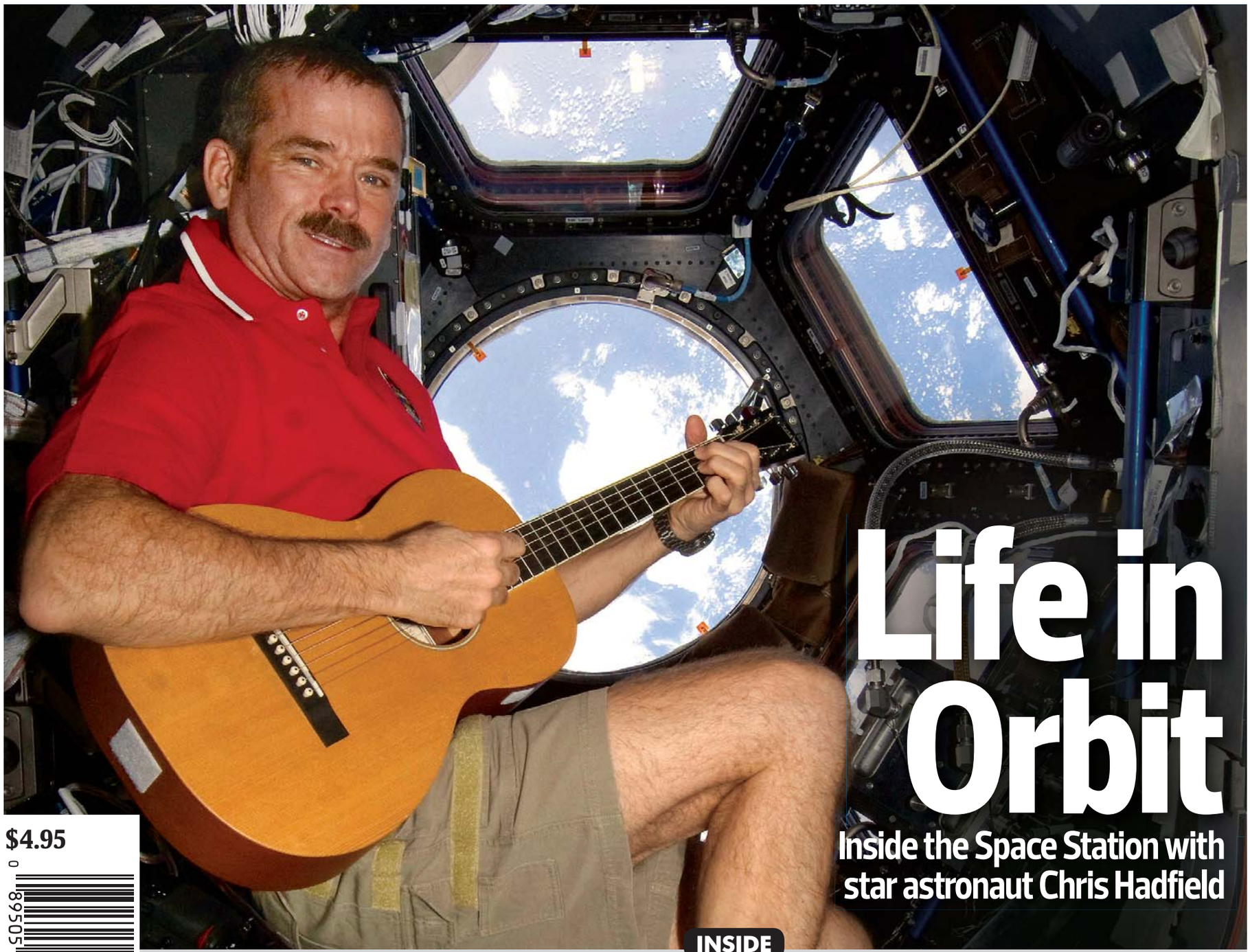
NASA'S FUTURE IN SPACE



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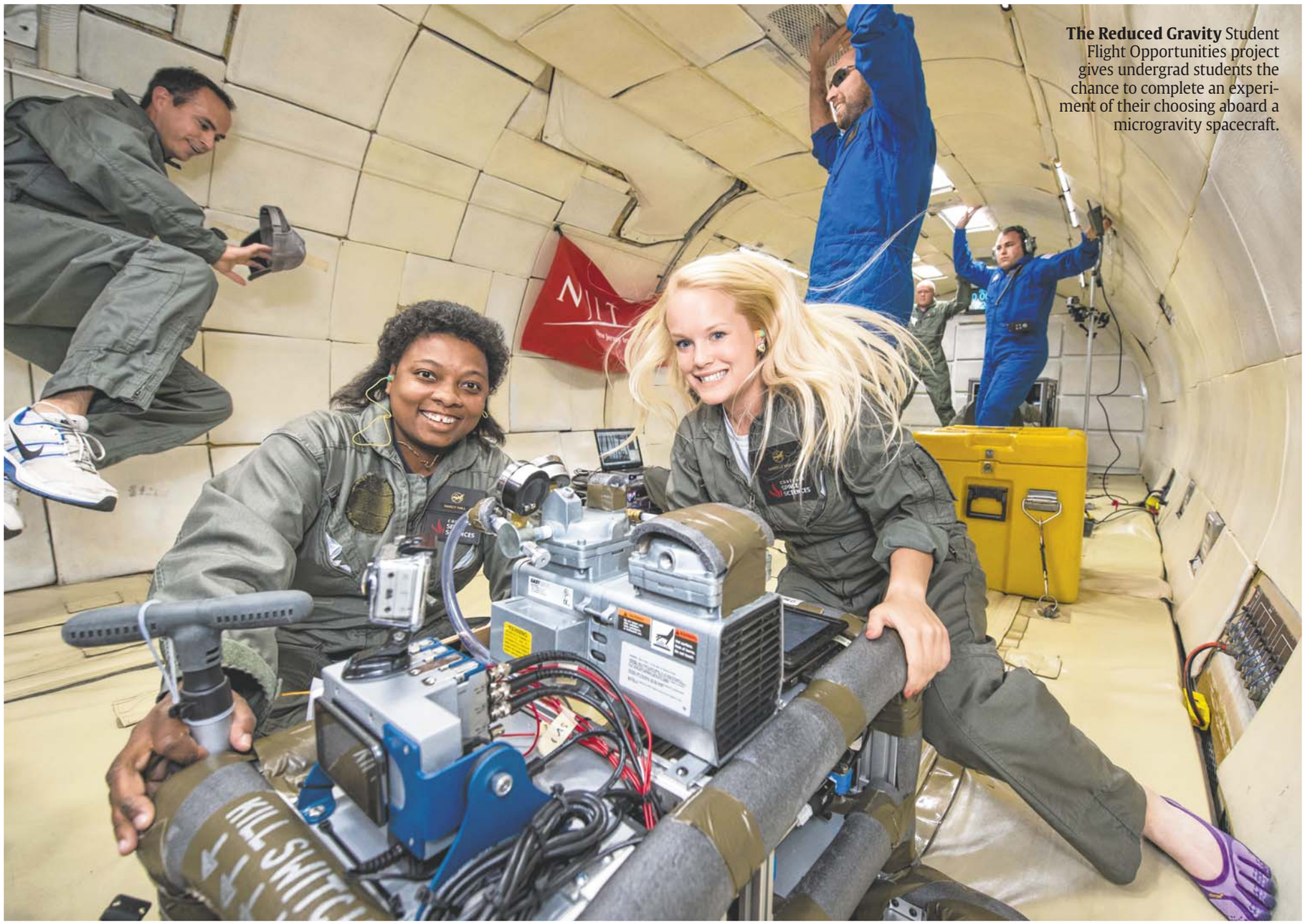

The Reduced Gravity Student Flight Opportunities project gives undergrad students the chance to complete an experiment of their choosing aboard a microgravity spacecraft.

NASA

HIGHER EDUCATION

A LAUNCHING PAD TO OUTER SPACE

By Terri Williams

HIGHER EDUCATION IS CRUCIAL to the continuing success of space exploration, and nobody knows this better than NASA. Colleges and universities are a gold mine for the type of creative efforts and technological innovation needed to propel exploration efforts to the next level. And NASA has created a number of programs designed to promote this scientific progress.

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One high-profile and highly successful example is the Robotic Mining Competition, held yearly at NASA's Kennedy Space Center (KSC) in Florida. Formerly known as the Lunabotics Mining Competition, the program encourages teams of university students to build a robot that can travel over the type of rough terrain found on Mars and the moon. The robot must excavate and deposit 10 kg of regolith, a soil simulant, within a 10-minute timeframe.

The robots must be comparable to the designs used by NASA engineers. Students must consider vehicle mass, communications bandwidth and power requirements. The robots also have to be controlled autonomously from a remote mission-control center. In addition, the students must prepare a systems engineering report, create an outreach plan for their local communities and present their engineering designs and robots to NASA competition judges.

"Researchers at KSC benefit from the Robotic Mining Competition because they have the opportunity to observe dozens of creative, innovative design—from vehicles to components to remote control options—at one time, in one setting, said Hortense Diggs, KSC's education director. "And by immersing students completely in the design and fabrication of these robots, NASA is fostering a greater interest in STEM careers."

STEM careers involve science, technology, engineering and math skills. But NASA's association with universities is not limited to STEM students.

The NASA Wearable Technology Symposium provides an opportunity for students from a cross-section of majors to present designs, strategies and ideas that integrate electronics and fabric. Mentors from the Johnson Space Center in Houston work with college students across disciplines to produce cutting-edge inventions that combine fashion and function.

One idea that came from the partnership are boots that allow astronauts to manipulate controls with their toes. Virginia Tech engineers and computer science majors worked with industrial design and architecture students to create a concept that puts a jetpack control system in the boots of a spacesuit. By depressing the toes, astronauts can move forward; raising the toes causes backward movement. The design allows astronauts to use

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"The student competitors of today could very well be the engineers and explorers of tomorrow."

—Leland Melvin, NASA's associate administrator for education and a two-time space shuttle astronaut

MINING FOR A WIN

The university teams who compete in the Robotic Mining Competiton must submit an application and be endorsed by a university faculty member. The first 50 applications are accepted. In 2013, participating colleges from around the country included Montana State University, the University of Arkansas, Virginia Tech and the University of Alabama at Huntsville. International teams came from countries that included Poland, Canada, Australia and India. The winning team receives the Joe Kosmo award for excellence, a $5,000 scholarship and an invitation to attend an upcoming launch at the Kennedy Space Center.

The Robotic Mining Competition pits university teams against one another in the quest to create a functioning, digging robot.
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College students run an experiment in a microgravity environment as part of the Reduced Gravity Education Flight program.

"By immersing students completely in design and fabrication of these robots, NASA is fostering a greater interest in STEM careers."

—Hortense Diggs, Kennedy Space Center's education director

their hands to hold tools and perform other functions while moving across the surface of a low-gravity asteroid.

Another design solves a big problem for astronauts: moisture building up in gloves. Students from the University of Minnesota's College of Apparel Design created moisture-wicking gloves made with polyacrylate crystals, similar to the substance found in diapers. It's a sorely-needed invention since the ability to counteract perspiration build-up keeps an astronaut's hands free from blisters, chaffing and cracked and broken fingernails.

One of the most ambitious projects to date could be around the corner. President Barack Obama's proposed 2014 budget for NASA funds a robotic spacecraft that can capture a small asteroid and move it to a stable location under the moon where astronauts can study it. The plan calls for students to create a large, inflatable module made of a fabric that is rugged enough to protect the asteroid without damaging it.

The scientific opportunities are vast, and Leland Melvin, NASA's associate administrator for education, said that as students enter the workforce, "we hope their NASA experience will prompt them to consider a career with us and become part of America's next chapter of exploration."

LAUNCHING PAD

HOW NASA INCREASES COMPETITIVENESS

Grants help communities vie for important research funds

The Experimental Project to Stimulate Competitive Research, or EPSCoR, is a collaborative effort between NASA, higher education and industry that seeks to level the playing field in states and regions that have not been able to compete for federal research and development awards.

EPSCoR serves several purposes: It improves the targeted area's research infrastructure and research and development capacity in jurisdictions that are important to NASA's mission. It also increases the quality of science, technology, engineering and mathematics education in those regions.

Combined with economic development, the program improves the potential for these jurisdictions to compete for NASA grants and support from other areas.

NASA EPSCoR provides two types of awards. "Research Infrastructure Development or RID awards enable states to build and strengthen relationships and improve contacts with NASA researchers and to develop ideas for future proposals," said Lenell Allen, director of Aerospace Research and Career Development.

The second type of awards are Research Awards. "Research awards result from topic-specific proposals targeted at high-priority NASA research and technology development needs in earth and space science, human exploration, aeronautics and space technology," Allen said.

For example, researchers at the University of South Alabama discovered a way to produce stitched-fiber reinforced polymers, which adds both adhesion and mechanical interlocking between carbon fibers and nanofibers. This invention will result in stronger, yet lighter aerospace materials.

In addition, the University of Nebraska has developed a Radio Frequency Identification and Location system that can allow doctors to follow food or medication from the manufacturing process to the time of consumption.

On a yearly basis, EPSCoR solicits research proposals for three-year research awards. The maximum amount of each research award is $750,000. The number of awards given varies from year to year and is dependent on the available budget.

Allen said the National Science Foundation determines overall state eligibility for EPSCoR. "This provides states that have been traditionally less competitive in receiving federal research and development awards with opportunities that stimulate sustainable improvements to their research and development capability and competitiveness," said Allen.

—Terri Williams