



NEVADA SPACE GRANT CONSORTIUM

PREPARING OUR FUTURE WORKFORCE THROUGH STEM OPPORTUNITIES

"It's a new type of skill set that (students) have to have, and that's a STEM skill set," Nevada Governor Brian Sandoval said. "That's what we need to teach in the high schools and moving up through the community colleges and the universities so that they'll be prepared for the workforce of the future."



2016 AACT/UNR Rover Team, NASA Marshall Space Flight Center

90%

OF ROVER TEAM STUDENTS PURSUE A STEM DEGREE IN COLLEGE

The AACT Rover program is a hands-on engineering experience for High School students in Reno, Nevada, supported in part by the Nevada NASA Space Grant Consortium (NVSGC). The program has had a significant direct impact on nearly 100 students since its inception in 2010. Recently, Danielle Kiserow, AACT Academy student, was accepted to the astrophysics program at renowned Embry-Riddle Aeronautical University with scholarships. Danielle cites being a member of the Rover team as the reason for her interest in a science career.

GRADUATE SCHOOL

NASA AMES RESEARCH CENTER SUMMER INTERNSHIP FUELS STEM GRADUATE CAREER QUEST

Sierra Adibi, NVSGC undergraduate scholar spent this last summer in the Aeromechanics branch of the NASA Ames Research Center. Time in her internship found her performing Computational Fluid Dynamics analysis of experimental aircraft, editing a 100+ page technical data report and assisting in the wind tunnel testing of the Mars Scout Helicopter.

Adibi says, "My NASA internship directly helped me to develop the skills I needed to write proposals for nationally-competitive fellowships by exposing me to real world research problems in aeronautics. These fellowships have the potential to fund my graduate education up through the completion of my doctorate, which will have enormous effect on both my education and career. I couldn't have completed, or even been qualified for, my NASA internship without the support of the Nevada Space Grant Consortium, which helped fund many of my undergraduate research projects."



The Baxter Robot, University of Nevada, Reno

Robotics isn't just for graduate students in the computer science program at the University of Nevada, Reno (UNR) anymore. Dr. David Feil-Seifer with curriculum development funding from NVSGC is updating current and developing new robotics courses to make them accessible for undergraduate students. The objective of the education plan is to provide multidisciplinary training to a broad body of students. The focus is on integrating research with undergraduate and graduate education leveraging state-of-the-art facilities in the UNR College of Engineering.

ROBOTICS

CURRICULUM DEVELOPMENT

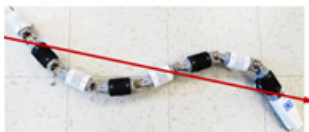


NEVADA NASA EPSCoR

STEM RESEARCH

3-D PRINTING EARTHWORM-LIKE ROBOT

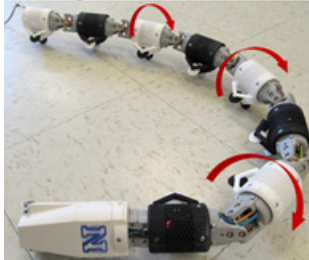
■ Serpentine locomotion.



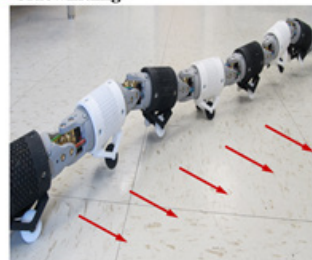
■ Steering



■ Rolling



■ Sidewinding



Locomotion modes of 3-D printed robot

A statewide collaboration of faculty from the University of Nevada, Las Vegas, University of Nevada, Reno and Truckee Meadows Community College are breaking ground in materials engineering with funding from NASA EPSCoR. A significant result this year was the continuing development of an ionic polymer-metal composite (IPMC) driven earthworm-like soft robot system and its advanced sensing and control methodologies. Three-dimensional (3-D) printing was used to build an earthworm-like robot that has two muscle-like structures that mimic the longitudinal and circular muscles of a biological earthworm. Four controlled locomotion modes were enabled by these two “muscle” types, namely serpentine, steering, rolling and sidewinding.

Award: **\$750k Federal, 375k State**

New research dollars awarded as a result: **Over \$5M, 3 awards**

Peer-reviewed publications: **8**

Students impacted, research experience and expertise: **9**

Return on Investment (ROI): 1:4

HUMAN-ROBOT COLLABORATION

ROBOTIC LANDMARK DETECTION AND TERRAIN CHARACTERIZATION

A team of experts from the University of Nevada, Reno (UNR), the University of Nevada, Las Vegas (UNLV), and the Desert Research Institute (DRI), in collaboration with the Intelligent Robotics Group (IRG) at NASA Ames developed new techniques for robot localization, landmark detection, human-robot collaboration, and terrain characterization. The horizon line was leveraged for rover localization in outdoor environments (Figure A) while new localization capabilities were developed for the SPHERES robotic system which is available on the International Space Station (ISS). To support future planetary missions where teams of humans and robots are envisioned to work together, we designed adjustable autonomous control and interaction capabilities for robots working with human users, in collaborative teams (Figure B). Finally, we developed an approach for mapping rover mobility of a landscape that exhibit variable surface lithology and geometries (Figure C).



Figure A: Rover localization using the horizon line

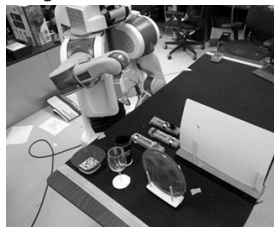


Figure B: Human-Robot Collaboration

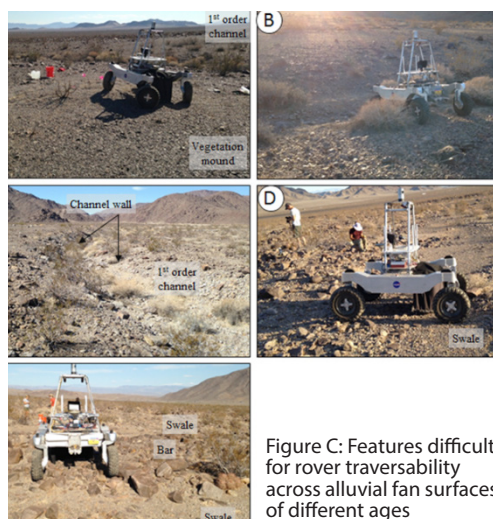


Figure C: Features difficult for rover traversability across alluvial fan surfaces of different ages

Award: **\$750k Federal, 375k State**

New research dollars awarded as a result: **Over \$7.4M, 11 awards**

Peer-reviewed publications: **18**

Students impacted, research experience and expertise: **20**

Return on Investment (ROI): 1:6

HISTORY

1988 CONGRESS DIRECTS
NASA

to develop America's critical
science, technology, engineering,
and math (STEM) workforce in
NASA-related fields

PARTICIPANTS

>900 AFFILIATES and
COLLABORATORS
- in all -

50 STATES
plus DC and PR
Universities, community colleges,
NASA field centers, industry,
museums, and agencies

EDUCATION

>4,500 students received
Space Grant funding*
including >1,000 community college students

88% of Space Grant
students remain in
STEM fields

*FY 2014

OUTREACH

>19,500 EDUCATORS
ENGAGED

>168,000 PRE-COLLEGE
STUDENTS
REACHED

FY 2015

DIVERSITY

22% UNDERREPRESENTED
PARTICIPANTS

38% FEMALE
PARTICIPANTS

FY 2015

ADDED INVESTMENT

**FOR EACH
NASA DOLLAR,**

>\$1 is contributed from other
sources.

REQUEST FOR FY 2018 APPROPRIATIONS

- \$45 million (\$5 million over current level to increase STEM workforce development initiatives).
- Support for a cap of 5% on administrative fees assigned to NASA.
- Support for the entire appropriated amount, less NASA's administrative fees, to be allocated annually to the states so that consortia may competitively distribute the funds within the state to meet local, regional, and national needs.

JUSTIFICATION

- The National Space Grant College and Fellowship Program is a successful initiative of NASA that began in 1988.
- Space Grant is a competitive, national partnership program responsive to regional and national needs that is administered through consortia across America.
- Space Grant consortia are catalysts in each state to help grow a high-tech workforce.
- Space Grant provides significant funding to thousands of university and community college students through scholarships, fellowships, internships, and hands-on research experiences, preparing them for advanced study and/or careers in STEM fields.
- Space Grant reaches tens of thousands of K-12 students and teachers as well as hundreds of thousands of members of the general public across the entire country.
- Space Grant is committed to diversifying the STEM workforce and supports the participation of women and underrepresented minorities.
- Space Grant more than doubles NASA investment through matching funds and partnerships.

ABOUT THE NATIONAL SPACE GRANT ALLIANCE

The NSGA exists to enhance the capacity of the United States of America to carry out education, research, and public outreach activities in science, technology, engineering, and mathematics (STEM) disciplines and additional fields related to space and aeronautics.