COLORADO COMMUNICATOR

Providing a diverse group of Colorado students with research & hands-on experiences to prepare them for our nation's future space programs and supporting industry.

INSIDE:

DANDE Launches: Students Engaged in Mission Operations

The DANDE spacecraft launched on September 29, 2013 aboard a SpaceX Falcon 9 rocket along with Cassiope, CUSat and POPACS. The DANDE mission is a culmination of 6 years of effort that engaged over 150 students - graduate and undergraduate - from various engineering and science disciplines supported by industry and academic mentors. The DANDE (Drag & Atmospheric Neutral Density Explorer) spacecraft will study the Low Earth Orbit drag environment.

After being successfully deployed, the student team on the CU campus was able to conduct DANDE's first passes over Boulder. The mission operations team was tested early-on as tracking the satellite became challenging due to other objects released in DANDE's orbit. Working closely with the student team that maintains the CU Ground Station, the DANDE mission operators have been able to confirm DANDE's health and status. On October 30th, the team successfully

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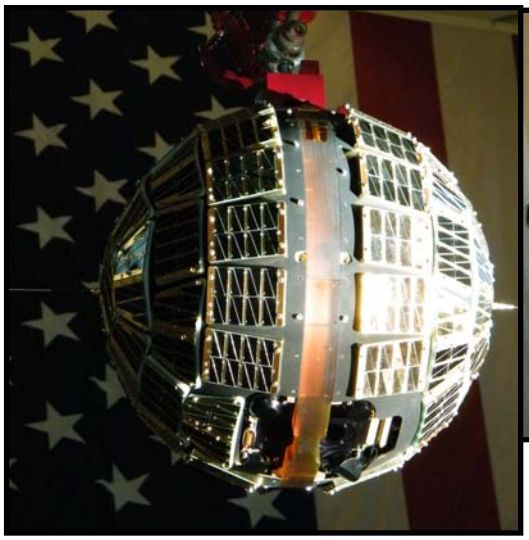


(l to r) The DANDE spacecraft following final testing at AFRL; CU Space Grant students celebrate acknowledgement of DANDE's first pass

Statewide Community College Transfer Program

Following a 1.5 year pilot program, COSGC submitted a proposal to implement the COURSE (COlorado Undergraduate Retention in Science and Engineering) program. COURSE was awarded 2-year funding through a NASA National Space Grant College and Fellowship Program opportunity. COURSE will formalize the process to engage students who graduate from COSGC community colleges and transfer to COSGC 4-year institutions. Students who transfer within the COURSE program will receive a scholarship in addition to a guaranteed position on a student research project. Faculty at each of the COSGC 16 institutions of higher education are engaged in the COURSE program and facilitate hands-on opportunities for students across the state. Three students are currently participating in the pilot program (two from Trinidad State Junior College and one from Community College of

Continued on page 10...

COLORADO SPACE GRANT AFFILIATES

Adams State University
George Sellman
Colorado Mesa University
Phil Kavanagh
Warren MacEvoy
Colorado School of Mines
Joel Duncan
Colorado State University
Azer Yalin
Colorado State University Pueblo
Jude DePalma
Community College of Aurora
Victor Andersen
Community College of Denver
Teresa Adams
Fort Lewis College
Charlie Hakes
Metropolitan State University
Aaron Brown
Pikes Peak Community College
Liz Coelho
Pueblo Community College
Bill Hardwick
Space Foundation
Iain Probert
Trinidad State Junior College
Cindy Clements
Bob Philbin
University of Colorado Boulder
Brian Sanders
University of Colorado Colorado Springs
Steve Tragesser
University of Northern Colorado
Bob Walch
Western State Colorado University
Suzanne Taylor

Director's Corner

This June will be my 14th year with Colorado Space Grant. I am grateful to be able to spend my career with such a rewarding program. "What makes Colorado Space Grant such a rewarding place to spend a career?" you might ask. Besides our secret time machine and fully operational transporter, it's the students. They are so excited to be a part of this real space program. Each year, new students find their way through the doors of one our 17 affiliate institutions and discover a whole world of opportunities that provide them a path that will help them access exciting careers in the field of science, engineering STEM education and/or technology. Working with these students keeps that sense of wonder I had as a student alive. In this edition of the Colorado Communicator you'll get a glimpse into what we've been up to the past year. I'll mention a few of my favorite moments now.

Being part of the crowd of students on the CU campus watching our DANDE satellite launch live on-screen is something I will never forget. A true sense of family filled the room as one by one former COSGC students joined the room of current students to watch the event. One former student even called in moments before the launch from Afghanistan just to be a part of the group and experience. DANDE is COSGC's first free-flying, student built, satellite to make it into Earth orbit.

Watching students from all over the state present their COSGC research at our annual symposium left me in awe at the reach and the importance this program has in Colorado. For the last several symposia, we have invited back former students to be our keynote speakers. It was a real treat to have current students hear from David Ferguson (SpaceX) this year.

Another moment that will standout long after 2013 occurred at our annual meeting in Trinidad, Colorado. Imagine a big, rectangular table and sitting around it a bunch of adults with rainbow colored baseball caps with yellow propellers on top of them (including affiliate directors and COSGC leadership). The caps were to help us think clearly about the topic at hand: How to be more inclusive of underrepresented and female students in our COSGC programs statewide. The discussion that day was truly inspirational to me and I believe others. All walked away with a new perspective on the importance of this issue and renewed enthusiasm for making our ideas a reality. Through follow-up telecons we're already sharing how many of those ideas are being implemented across the state. With the addition of the newly awarded 2 year COURSE (COlorado Undergraduate Retention in Science and Engineering) program, we have additional resources to implement these ideas.

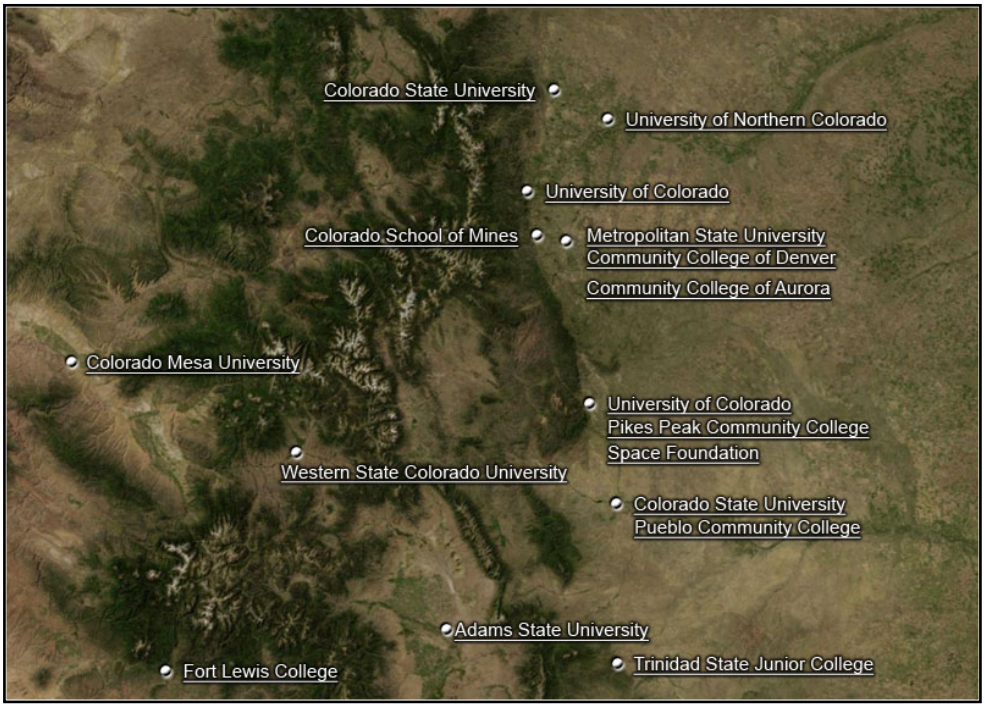
COSGC's purpose is to serve students. The number and make up of that student population is important to NASA and to us who make the program happen. If your life and/or career has been changed for the better because of COSGC, consider supporting a current student by sending in money. I know that sounds blunt but I will not sugar coat it - we need your help. NASA funding for the COSGC program has remained flat for the last three years. Funding levels have actually dropped by nearly 45% since 2011. While we have been creative in keeping our numerous student programs going, each year it gets more difficult not to turn away new students. Your support can make a direct and immediate impact on our students. No amount is too small to make a difference. Also no amount is too large either. :) Significant donors get a one free ride in our time machine too.

Thank you for your attention and support. Enjoy reading this issue of the Colorado Communicator.

2013 Undergraduate Space Research Symposium

COSGC's annual Undergraduate Space Research Symposium was held April 20, 2013. Students from COSGC institutions across the state presented research papers to panels of industry engineers and scientists. Industry partners also volunteered their time to read and judge student papers prior to the presentations. Students competed for cash prizes sponsored by local aerospace companies. The Grand Prize winner was "Autonomous Soil Investigator" by Matt Bird, Josh Gillham, Scott McGimpsey, Max Lichtenstien, and Matt Wicke (Metropolitan State University of Denver). Session winners were Progress Asoluka, Austin Genger, Kim Buchanan and Angel Gatchell (Community College of Aurora) with "Testing the Electric Field Circuit of the Earth"; Thomas Staver, Joanne Jimenez, Brett Gonzales, and Jeff Manders (Trinidad State Junior College) with "C.A.T.: Crawling Autonomous Terrabot"; Alexandra Hickey, Evan Schomer, Richard Marcus and Frank Erdesz (University of Colorado Boulder) with "Design and Implementation of Low-Cost Optical Telemetry to Support Radiometric Analysis of the Atmosphere"; and Caleb Lipscomb and Jonathan Sobol (University of Colorado Boulder) with "HELIOS II". The winners of the hardware demonstration and poster session were Trinidad State Junior College students mentioned above for "C.A.T." and Colorado State University students, Seth Davis, Betsy Farris, Alexander Mende, Constantino Tadiello, and J. Williams with "Laser Sensor for Atmospheric Carbon Dioxide Measurement."

(L to R) The grand prize winning team from Metropolitan State University pose with COSGC Deputy Director, Brian Sanders and show off their Autonomous Soil Investigator; The robotics team from Trinidad State Junior college pose after their paper presentation and show off their Crawling Autonomous Terrabot.



The **Colorado Space Grant Consortium** (COSGC) uses the excitement of our nation's aeronautics and space programs to inspire, educate, and develop America's future technological workforce by enabling a diverse community of college and university students.

COSGC consists of 16 institutions of higher education and 1 non-profit foundation in Colorado. COSGC students have access to resources including faculty and industry mentors, a clean room, assembly and integration labs, faculty research labs, a mission operations and control center, ground satellite tracking stations, observatories, as well as numerous partnerships with NASA Centers and industry.

AFFILIATE UPDATES

Adams State University

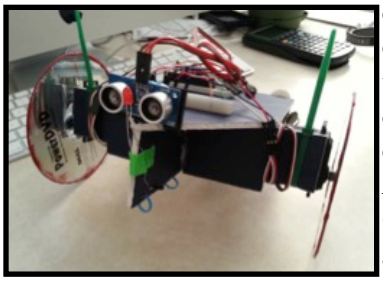
Students engaged in a robotics activity at Adams State University.

Adams State University (ASU) Space Grant sponsored several teams for the 2013 Robotics Challenge. All teams had access to the 3-D printer to machine parts as they explored various systems in autonomous robots including I2C communications and Multi-Echo Ultrasonic communication. The teams continue to develop both wheeled and non-wheeled robots.

Students engaged in robotics projects work with ASU faculty to facilitate an ASU lunch lecture series to recruit new members and spread the word about the Robotics Society. They also engage with the local community with the robotics effort at high schools and middle schools in addition to Saturday workshops for BOCES gifted and talented, and at the Trinidad State Junior College Alamosa campus.

The ASU Space Grant program continues to collaborate in the STEM Title V award by providing a summer STEM academy for high school students. The academy is a one-week residential program that includes various STEM disciplines including Robotics. This marked the 2nd year of the program. The robotics effort included a greater focus on programming and less on building.

ASU students also participated in other research projects including the development of a UAV/quadcopter, the design, build and testing of a mosquito counter in collaboration with Alamosa Mosquito Control District and alternative beacon experiments.



An ASU student designed and built robot

Community College of Aurora

This year was the first time Introduction to Experimental Design was offered at Community College of Aurora (CCA). The course was designed by CCA Affiliate Director, Victor Anderson - patterned after the successful Gateway to Space course currently taught at the University of Colorado at Boulder. The course was implemented by CCA Space Grant as an effort to reach more students from a wider range of disciplines in CCA Space Grant projects. The course focuses on the completion of a balloon payload mission. Students work in teams to design, build, test, launch, and analyze data during one semester. Guest lecturers from universities and industry provide real-world content and three CCA faculty help facilitate the course.

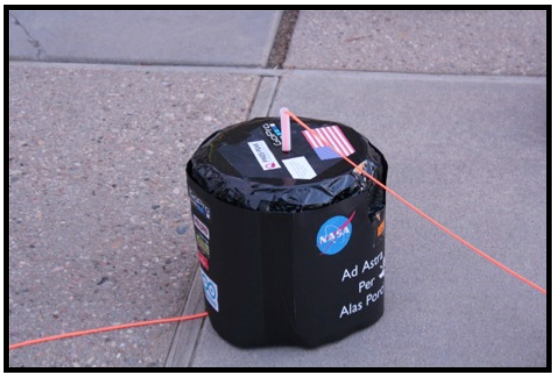
(below)CCA students pose with industry sponsor and COSGC Deputy Director as they accept their session prize; (above) picture taken by CCA balloon payload during flight.

Fifteen students participated in the inaugural semester and worked in four teams all with unique missions. All four student teams submitted abstracts to, and were accepted as, paper presenters in the 2013 COSGC Undergraduate Space Research Symposium. The team demonstrating the utilization of an electric field mill won 1st prize honors in their session. One of the students from the course, Gerardo Pulido, was accepted into University of Colorado at Boulder (CU) and is currently working on a CU CubeSat mission while earning a BS in aerospace engineering. Intro to Experimental Design will be taught again in spring 2014.

Pikes Peak Community College

Students carry strung payloads to launch site

The Space Grant program at Pikes Peak Community College (PPCC) sponsored one student team to participate in the statewide COSGC DemoSat program. A team of four students designed, built, tested, and launched a balloon payload developed to explore the effect of cosmic radiation on schizosaccharomyces pombe yeast cells.



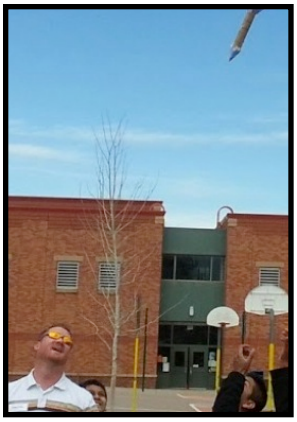
PPCC 2013 payload strung and ready for launch.

Community College of Denver

Students at Community College of Denver (CCD) Space Grant participated in three DemoSat launches over the year! The team was attempting to do several experiments on their payload. Students learned from each flight and improved experiment design. The two main experiments were effects of cosmic radiation on Zebra Fish embryos and an air sampling system. In addition, the team was experimenting with a student-designed flight computer and sensor package. This team was able to fly their payload and follow-on iterations in November 2012, and April and August 2013.

CCD balloon payload team eagerly awaiting launch.

Affiliate Director, Laona Burke, left CCD to go back to school for a PhD after the summer launch. Teresa Adams, Mathematics Professor, stepped in as the new AD for CCD Space Grant and supported the summer launch in addition to recruiting new students for a fall 2013 payload team. The new team designed and built a payload that launched with the November 2013 DemoSat flight.



CCD faculty sponsor watches K-12 student rocket launch.

CCD Space Grant students also develop rocket activities to use during a Rocket Day for local K-12 students. The effort is a chance for younger students to interact with CCD students to peak their interest in going to college in a STEM discipline.

Colorado State University

Colorado State University (CSU) Space Grant sponsored a mechanical engineering senior design team to work on the ASCENDS CO2 Laser Sensor. The project is a partnership with Dr. Prasad Narasimha at NASA Langley. Dr. Narisimha provides mentorship for students and access to a diode laser source to complete the research.

CSU autonomous robot at 2013 Challenge.

CSU Space Grant students also participated in COSGC statewide efforts: Robotics Challenge and the DemoSat program. The CSU DemoSat team participated in the summer program, but were able to re-launch the payload on the fall DemoSat flight in order to tweak aspects of the experiment. The team explored soft errors in SRAM and flash memory caused by cosmic radiation. In addition, CSU Space Grant student Jordan Rath, who serves as Student Manager of the CSU Space Grant program, conducted research on Plasma-

Material Interactions in collaboration with Air Force Research Laboratory and University of Michigan.

Undergraduate teams submitted both paper and poster sessions for the annual COSGC Undergraduate Space Research Symposium. The ASCENDS team won in the poster session.

CSU team accepts accolades following their presentation at the annual Symposium.

Colorado State University - Pueblo

Space Grant students at Colorado State University - Pueblo (CSU-Pueblo) continue work on the Sabatier Reactor - exploring the creation of fuel for a return trip from Mars. Work this past year included the addition of an automated cryogenic separator.

The past year former Affiliate Director, Huseyin Sarper retired. Dr. Jude DePalma accepted the position of AD for the CSU-Pueblo Space Grant program. Dr. DePalma's initial efforts have been to oversee the completion of projects already underway. In addition to the Sabatier Reaction, these include an autonomous robot and a lander designed to deploy the robot once landing has been detected.

CSU-Pueblo autonomous robot and lander.

Fort Lewis College

The Fort Lewis College (FLC) Space Grant program hosted the fall 2013 COSGC Robotics Workshop. Students from FLC, Western State Colorado University and Adams State University participated in the workshop as a kick-off for the team projects that will culminate in the annual Colorado Robotics Challenge in April 2014. FLC Space Grant also sponsored two DemoSat teams - one in summer and one in fall 2013. The FLC balloon payload teams are developing a reliable foundation system that will regulate temperature, record GPS and acceleration and provide steady power. The new system has gone through two iterations. The ultimate goal is to have a reliable basis for future student teams to be able to focus on more complex experiments. FLC students and faculty continue to undertake astronomy projects at the local FLC Observatory.

COSGC students at a statewide workshop on FLC campus.

FLC Students programming an Arduino.

Colorado School of Mines

The Space Grant program at Colorado School of Mines (CSM) underwent a change in Affiliate Directorship. Dr. Bob Knecht retired and Dr. Joel Duncan agreed to step in to manage the CSM Space Grant program. Students at CSM Space Grant participate in balloon payload projects that are a part of the EPICS courses. EPICS courses provide an open-ended design problem that students must solve as part of a team effort.

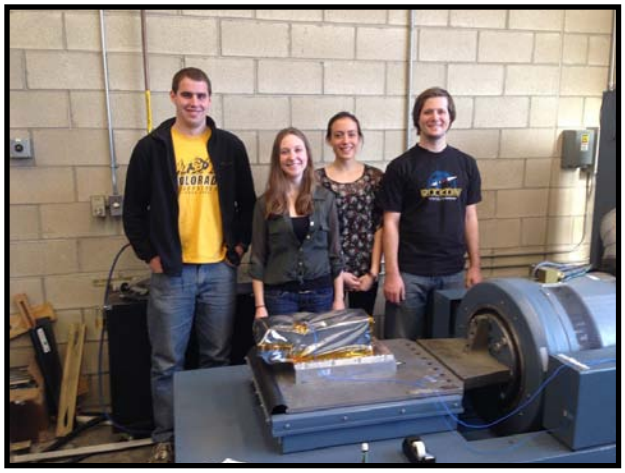
University of Colorado - Boulder

CU Space Grant students are currently engaged in mission operations following the successful launch of the DANDE satellite on September 29th. The ALL-

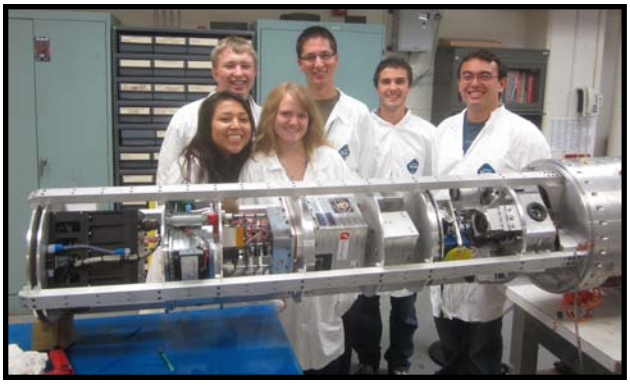
STAR cubesat team completed testing and integration and delivered the ALL-STAR payload (3U CubeSat) to CalPoly in December where it awaits launch as part of NASA's ELaNa program, scheduled for March 2014 at the printing of this newsletter. Both the DANDE and ALL-STAR projects are supported by students teams that work to design and implement the ground station in the CU Space Grant facility on the CU Boulder campus and an S-band station on a nearby rural property. A student team launched a long-duration balloon payload called HELIOS II in September 2013 to study sun dynamics in partnership with the Center for Atmospheric and Space Astronomy (CASA).

HELIOS II students in Palestine, TX doing final testing as they work toward integration and launch.

Two teams of students launched rocket payloads as part of the RockSat X program at NASA's Wallops Flight Facility. One team designed a reusable payload to be used to visually record RockSat X flights annually. The 2nd team explored crystallization in space as a collaboration with Air Force Research Labs. The PolarCube cubesat team won funding and a spot in the NanoSat 8 competition through the Air



Students overseeing vibration testing of the ALL-STAR payload at CalPoly during payload delivery.



CU Students posing with their fully integrated payloads at NASA's Wallops Flight Facility in Virginia.

Force Office of Scientific Research's University Nanosat program. The PolarCube mission is a collaboration with the National Snow and Ice Data Center and CU's Center for Environmental Technology.

Western State Colorado University

The Western State Colorado University (WSCU) Space Grant program hosted a spring 2013 western slope robotics workshop. Three WSCU students who

WSCU students working on their autonomous robot at the 2013 Makerspace in Alamosa, CO.

participated in the workshop went on to make up the WSCU Robotics team that participated in the April 2013 Colorado Robotics Challenge. A WSCU team is working on a new robot for participation in the April 2014 Challenge. In addition, WSCU Space Grant is sponsoring a team designing and building a balloon payload scheduled to launch with the spring 2014 DemoSat flight. Finally, one WSCU student worked with faculty to make simultaneous observations with two telescopes. The effort was to understand whether the positional shifts seen in all drift-scan observations were caused by the telescope housing.

Trinidad State Junior College

TSJC students and faculty mentors pose with their 2013 Robotics Challenge autonomous robot.

The Trinidad State Junior College (TSJC) Space Grant program sponsored teams of students for both the statewide DemoSat program and the Colorado Robotics Challenge. The TSJC DemoSat team designed a unique payload to explore the resistivity of the air as a function of altitude. TSJC Space Grant has a thriving robotics program that includes close collaboration with Parallax Inc. which has provided training and electronics for TSJC Space Grant teams.

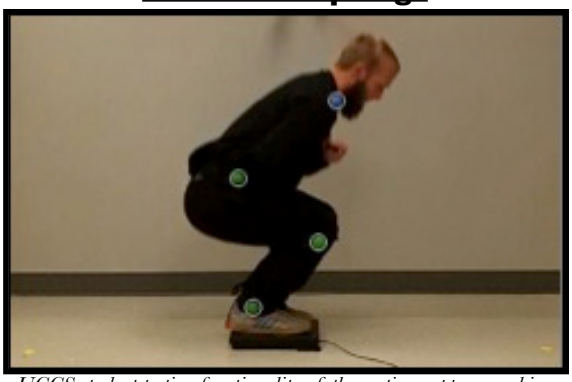
(left) TSJC students and faculty mentor pose with their balloon payload following flight and recovery; (right) Students machine parts for their robot.

University of Northern Colorado

The Space Grant program at University of Northern Colorado (UNC) offers students a variety of ways to participate in robotics project. These include a robotics course and extracurricular opportunities to work with faculty and peers to explore sensor development, swarm behavior, the process of balance and more. UNC Space Grant students provide mentorship for high school students engaged in robotics projects during the Frontiers of Science Institution on the UNC campus during the summer.

UNC students working on robotics project.

University of Colorado Colorado Springs

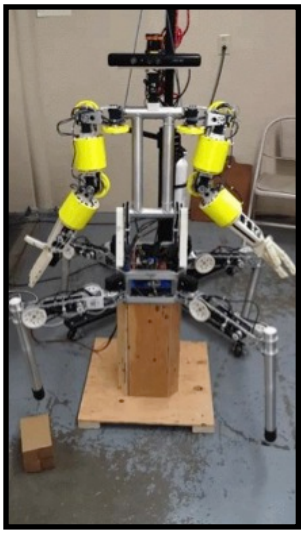


UCCS student testing functionality of the motion capture machine.

Students at University of Colorado, Colorado Springs (UCCS) Space Grant continue to work on biometrics research. This past year, students designed a low-cost motion capture machine and algorithms with which they are using to determine the biomechanics of walking which they will then apply to exploration of the efficiency of human movement in a low-gravity environment.

Colorado Mesa University

The Space Grant program at Colorado Mesa University continues to support students working on robotics projects that are proven at the annual Colorado Robotics Challenge each April. In addition to participating in the statewide program, CMU Space Grant students have competed in the DARPA Robotics competition for several years. The program has received funding from the Air Force to install a telescope on campus for student use. In addition, CMU Space Grant sponsors an undergraduate course focused on introductory robotics.



The robot designed and built by CMU students for the DARPA robotics competition.

Meanwhile, Across the State...

The Colorado Space Grant program continues to support established, statewide efforts that provide launch opportunities and hardware demonstrations as resources with which COSGC affiliate directors may shape their programs.

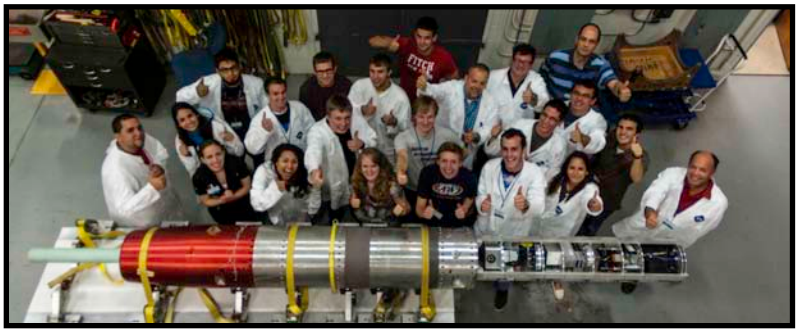
The first of these is DemoSat. Three short-duration balloon payload launches took place as part of the DemoSat program. Students participated in mission reviews and launches. A total of 26 undergraduate payloads flew (representing 8 COSGC institutions) on five 2013 DemoSat balloon flights in April, August, and November. Students work in teams either enrolled in courses or as extracurricular activities. Launches are provided by Edge of Space Sciences - a non-profit organization that has facilitated DemoSat launches for over 12 years! More information, including the program schedule, may be found at http://spacegrant.colorado.edu/statewideprograms/demosat-homepage .

The 7th annual Colorado Robotics Challenge was held on April 6, 2013. Student teams representing 7 COSGC institutions gathered in the early morning to demonstrate their autonomous robots' capabilities and attempt to get through challenges including fine blowing sand, rocks of all sizes, trenches, and human made obstacles. As a lead up to the Challenge, COSGC sponsored robotics workshops where students learned new tools, practiced skills, and established teams to participate in the event. COSGC's Colorado Robotics Challenge is held at the Great Sand Dunes National Park - testing site for the Viking Landers. Students participate in a MakerSpace in nearby Alamosa, the day before the Challenge. The 2014 Challenge is scheduled for April 5th. Visit http://spacegrant.colorado.edu/statewideprograms/robotics-challenge for more information.

Students and mentors at the 2013 Colorado Robotics Challenge.

...and the Country

COSGC continues to facilitate the RockOn! workshop in conjunction with Virginia Space Grant and facilitates two sounding rocket launch opportunities all in collaboration with NASA's Wallops Flight Facility. To date, over 240 faculty and students from across the country have participated in RockOn! and built over 79 payloads that were launched by the Wallops team.



RockSat X students and mentors with the fully integrated rocket.

RockSat-C provides student teams with a launch opportunity that includes regular reviews by COSGC faculty and students beginning in the fall semester and leading up to the summer launch. Payloads are student based and are supported through collaborations with faculty and industry involvement.

RockSat-X flights have an ejectable skin and a nose cone that will expose experiments to the space environment fully at apogee. Additionally, the rocket is de-spun to allow for a greater range of experiments. Participating teams are required to complete regular reviews with program facilitators.

Students participating in all programs participate in testing and integration of the payloads prior to launch. Teams are encouraged to attend launch and all payloads are recovered the same day. Both the C and X programs provide opportunities for students to work closely with faculty and industry mentors on a project that has low-cost access to the space environment. For more information about the RockOn! and the RockSat C and X programs, you may visit http://spacegrant.colorado.edu/national-programs.

COURSE Program continued

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Aurora). COSGC expects to engage between 20 to 25 students as transfer students in the COURSE effort. Students who are accepted into the program will participate in a summer bridge program at each campus. Each bridge program will include meeting current students and faculty on their new campus and interacting with students during tours of campuses and the community/resources surrounding each campus.

The **2013 COSGC Annual Meeting** took place on September 20 and 21, 2013. COSGC affiliate director Cindy Clements hosted the event on the Trinidad State Junior College campus. The meeting included a hands-on activity participants could use with their student teams; presentations from affiliate directors about 2013 accomplishments and plans for 2014; national and statewide programmatic updates; a focused discussion about underrepresented student inclusion; acceptance of the new COSGC Strategic Plan; presentations of student projects; and the official kick-off of the newly funded COURSE (COlorado Undergraduate Retention in Science and Engineering) initiative, which included great conversations about implementation of the program at all COSGC institutions of higher education and how to most effectively engage students. *Right: COSGC faculty and students put on their thinking caps to tackle serious discussions.*

DANDE Launches!

...continued from cover page

separated the satellite from the Lightband Adapter Bracket that attached DANDE to the launch vehicle.

Students continue to conduct mission operations. They have been doing instrument checkouts to characterize the health of torque rods and damping abilities. They continue to address bugs that come up in the software and have been able to address issues that have arisen in the first few months of DANDE's operation in orbit. The DANDE project would not have been possible without the support of Space Test Program, Air Force Research Labs, CU Aerospace Engineering Department, Ball Aerospace, University NanoSat Program, SpaceX, Sierra Nevada (formerly StarSys), LASP, CU's College of Engineering and Applied Science, CU Boulder faculty and industry mentors that include former students who have graduated but have stayed active with the DANDE mission and committed time to support up and coming students and see the project through.

Former and current Space Grant students pose as they eagerly wait to watch the launch of the DANDE satellite (left) in California near the launch site; and (right) in the Space Grant facility on the University of Colorado at Boulder campus.

Affiliate Director Snapshots

Colorado Space Grant student projects would not be possible without the efforts of committed and talented faculty at all of our affiliate institutions. In this new section of our annual newsletter, we will share some details about those who put in the time and effort to engage and mentor students - often on their own time - in addition to full teaching loads and all the other support they provide students each year.

Cynthia Clements (Cindy) is the co-affiliate director of the Space Grant program at Trinidad State Junior College (TSJC). Cindy became involved with TSJC Space Grant in 2009 when she volunteered to be the robotics advisor for the newly established program.

Cindy earned a BS in mathematics from California Polytechnic State University along with a teaching credential. Her senior project at CalPoly was math gaming. This was 1983 and desktop computers had just become readily available to the general public. She was commissioned by the San Jose School District to create math games for elementary math education. She taught at the Chadwick School in Palos Verdes, CA for three years and then went back to school at Oklahoma State University, where she earned an MS in mathematics.

Cindy has proven to be an untiring mentor for her students. She encourages them all to enroll in 4-year institutions and continues to mentor them as they move-on. Cindy has even directly communicated with faculty at 4-year institutions in order to gain a better understanding of how math classes at TSJC compare to the same courses taught at the 4-year institutions. Two of her former students were the first participants in the COSGC community college transfer student pilot program.

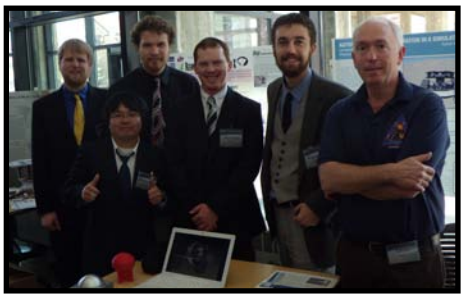
Cindy thoroughly enjoys her life in Trinidad, CO where she fills her time with reading, family, taking long walks and inventing new recipes. Her goal as an educator is to be an encouraging presence. She constantly challenges students to help them realize they can do more than they think and wants to be an active part of their educational journeys as they reach toward their goals and dreams.

Dr. Robert Walch (Bob) is currently the affiliate director who has been with the COSGC program the longest. In 1990 Bob was a faculty member at the University of Northern Colorado (UNC) working at the physics department at the University of Colorado at Boulder in a collaborative effort sponsored by NASA. During that time he was asked to be the affiliate director. He agreed to both and has been head of the UNC Space Grant program ever since.

Bob earned a BS in space science from Florida Institute of Technology. As an undergraduate he worked in the electrical engineering department doing research and development on high-powered lasers. Bob went on to earn an MS and PhD in physics from Ohio State University.

Bob has developed a robust Space Grant program at UNC. He has recruited faculty to help mentor students and facilitate student projects. He and his team have supported students as they have succeeded at various project including robotics, high altitude balloon payloads and sounding rocket payloads. Under his leadership UNC Space Grant has graduated talented students who have jumped right into industry.

Bob is an avid cyclist. In June 2013 he rode the Seattle to Portland cycling classic which was 204 miles in 2 days. He also runs marathons and climbs mountains. To date these have included all of the "14ers" in Colorado and others like Kilimanjaro, Fuji, and Mt. Hood. Bob also enjoys the microbrewing mecca that is Colorado as "drinking good beer" is on his list of things he loves to do. Bob continues to collaborate with UNC faculty to engage students in hands-on projects and provide opportunities they do not find elsewhere on campus.



Student Focus

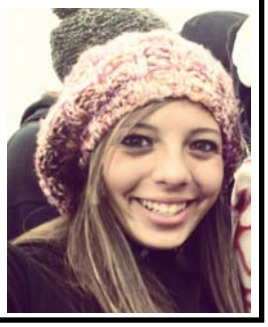
Colorado Space Grant engages over 300 Colorado students each year in space hardware missions and research projects, of which you have read about a few in the preceding pages. Introducing them all to our readers would take a newsletter all its own (an extremely thick one). Instead, we present a random sampling to give our readers an idea of the high caliber of students that are a part of the Colorado Space Grant family, the projects they are working on, and their plans for the future.

Betsy Faris graduated with a BS in Mechanical Engineering from Colorado State University, Fort Collins, in May 2013. While an undergraduate student at CSU, Betsy worked on the Laser Based Measurement of Carbon Dioxide Absorption Spectra at Simulated Atmospheric Conditions research project at CSU Space Grant. Betsy accepted a position at Southwest Research Institute in the Applied Physics, Electromechanical and Optical Systems Department. Betsy credits her Space Grant experience with "showing I was capable of explaining highly technical ideas to a diverse audience. My work on the project demonstrated my ability to learn quickly and solve problems and proved I was capable of working in a group setting to achieve a final product."

Gerardo Pulido is the newly hired Student Project Manager for the statewide COURSE effort *(see cover page)*. Gerardo transferred from Community College of Aurora (CCA) to the University of Colorado at Boulder (CU) in fall 2013. He first became involved with Space Grant at CCA through the Experimental Design course. Gerardo was fascinated with space since he was 8 years old and jumped at the chance to take a course where he could build and launch a balloon payload when he heard about it in a CCA physics course. While at CCA, he also dabbled in robotics with the CCA Space Grant program. Gerardo is now enrolled in aerospace engineering with a double minor in applied mathematics and computer science. He initially worked on the PolarCube mission at CU on the Command and Data Handling team where he was helping with the development of the flight board. Gerardo is a central contact for all transfer students who participate in COURSE and is helping with the implementation and facilitation of the program. His tasks include participating in statewide reviews of student balloon payloads in the DemoSat program *(see page 9)* and being TA for a high school balloon payload course. He plans on going right into a master's degree and eventually a PhD. Ultimately, Gerardo is interested in working at NASA and is especially interested in propulsion development of the future.

Miranda Link earned a BS in astrophysical and planetary sciences with a minor in geological sciences, graduating from University of Colorado, Boulder (CU) in December 2013. Miranda's first experience with CU Space Grant was in the Gateway to Space course. She joined the DANDE mission as a team member. Eventually, she was recruited as the co-Project Manager for the DANDE mission through testing, launch and mission operations. Miranda explains that, "Space Grant completely changed my life and has opened an infinite number of doors for me. The benefits of Space Grant to my education and future are astronomical." Miranda is currently interviewing at various companies and government labs as she prepares to enter the workforce. She continues to support the DANDE mission.

Camille Arn is a student at Trinidad State Junior College (TSJC) working toward an associates degree in science, general studies and arts. Camille is currently one of the students on the TSJC autonomous robot project and is focusing on sensor design. She is also fulfilling the responsibilities of project manager. Camille plans to transfer to a 4-year institution in order to earn a degree in Mechanical Engineering. She is excited about continuing to work on hands-on projects throughout her education so she can pin-down exactly what she would like to do as a career.

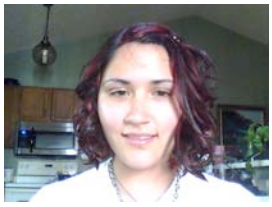


Evan Schomer *(far right in picture)* is an electrical and computer engineering student at University of Colorado at Boulder minoring in computer science. Evan started working at CU Space Grant on the MiniCam team (a balloon payload that proved camera design for the PolarCube mission). He was recruited to join both the PolarCube team and the ALL-STAR team (both 3U cubesat payloads). On PolarCube, Evan is the lead avionics engineer and for ALL-STAR he is a communications engineer. Evan explains, "my Space Grant work has given me invaluable real-word experience beyond the scope of my undergrad education." Evan plans to work in the space industry and is most interested in embedded systems design and RF/Microwave engineering.

Eric Perry is a sophomore at Trinidad State Junior College (TSJC) working toward an associate of science degree on the pre-engineering track. Eric is currently working on the TSJC autonomous robot project as the lead designer, as they work toward demonstrating their robot at the 2014 Challenge. He is applying to several 4-year institutions and plans to major in mechanical engineering and earn at least a bachelor's degree.

Michael Schenk is a junior at University of Colorado, Colorado Springs (UCCS) working on a major in mechanical engineering with a mathematics minor. Michael is working on developing a low-cost gait analysis system along with other UCCS Space Grant students. He credits his Space Grant experience with strengthening his programming and problem solving skills. "These skills have extended into my classes. I particularly feel more confident going into senior design having done work in the Space Grant lab." Michael plans to attend graduate school.

Shannon Shaw is a biology major at Western State Colorado University with a minor in Chemistry. Shannon is currently working on the WSCU DemoSat balloon payload team. She and her peers are building a payload that will examine the effect of the near space environment on E. coli. The team will launch their payload in April 2014. Shannon plans on attending medical school beginning in fall 2014.



Andrez Leyva is a sophomore at Trinidad State Junior College (TSJC) where he in the pre-engineering track as he works toward an associates degree in art, science, and general studies. Andrez is the lead mechanical student working with the team designing and building an autonomous robot as an extracurricular project on the TSJC campus. He will graduate in May 2014 and plans to enroll in a 4-year institution in a mechanical engineering degree program. Andrez also plans to continue his collegiate soccer career when he transfers into a 4-year university.

Where are they now?

University of Northern Colorado (UNC) alumnus, Jordan Aken, credits his experiences at UNC Space Grant with helping him secure a position working with the International Space Station. Jordan dreamed of working within the space industry while an undergraduate physics student. His dream inspired him get involved with UNC Space Grant. While a Space Grant student, Jordan worked on two missions: one was a high-altitude balloon payload (part of the statewide DemoSat effort) and the other was a sounding rocket payload (part of RockSat X). "On my first day at Boeing, I was told it was my previous space-related work that really made me a desirable candidate," said Jordan who started with the company in January 2013. "My manager said that the diversity of what I had worked on was what made my resume stand out above the rest." Although Jordan's office in Boeing's Houston facility, he is at NASAs nearby Johnson Space Center almost every workday. He splits his time among several areas that include flight operations and flight integration. He also works on international integration where he works with international partners to facilitate exchange of crew time, hardware, and spares between the different space agencies (NASA, JAXA, ESA, CSA, Roscomos, etc.).

(left) Jordan Aiken poses with a model of the ISS at the Boeing Houston facility; *(right)* Jordan (center, in blue hat) with his UNC team as they point to their fully integrated payload at WFF)

Inspired by her heat transfer and thermodynamics classes as an undergraduate at University of Colorado at Boulder (CU), Shannon Dickson applied for a thermal engineer position on the DANDE satellite team when she was a sophomore. While earning a BS in in engineering physics and an MS in physics, Shannon did DANDE thermal modeling and also helped on the science team and aided with integration and testing when she could. After graduating in May 2011, Shannon worked in a CU physics lab as a payload engineer for two sounding rockets that were supported by NASA's Wallops Flight Facility (WFF). The relationships she built at Wallops led to her current position with Orbital Science Corporation at WFF. Shannon is a mechanical integration and test engineer for Orbital's ANTARES launch vehicle, currently contracted for the commercial resupply is the ISS. She is the lead mechanical engineer for Stage 2. In this position she leads a team of technicians in operations for the second stage motor, payload, and fairing integration.

(left) Shannon Dickson at work on the ANTARES launch vehicle at NASA's Wallops Flight Facility; *(right)* Shannon poses with COSGC students at Wallops following integration of the students' RockSat X payloads.

Thank You and Farewell

2013 was a year of changes in the COSGC family. Three affiliate directors moved on to new experiences following many years and countless hours mentoring Colorado students *(pictured left to right)*. **Laona Burk** led the Space Grant program at Community College of Denver for one year and then was accepted into a PhD program. She facilitated several iterations of a balloon payload with talented CCD students. **Dr. Huseyin Sarper** took over as affiliate director for the Colorado State University - Pueblo Space Grant Program in 2007. Prior to that he supported CSU-Pueblo Space Grant as a mentor for student projects. Huseyin's passion for Mars exploration directly led to the Sabatier Reactor student project that has resulted in cross departmental collaborations on campus and travel nationwide. His enthusiasm will be missed as he begins life as a retired citizen. Finally, **Dr. Robert Knecht** (Bob) was the affiliate director of the Space Grant program at Colorado School of Mines since 2002. Bob coordinated a unique program that was directly linked to the first and second year student projects efforts on the CSM campus. He loved to get CSM students involved in NASA efforts and was integral at implementing an undergraduate summer research opportunity for students through the CSM Space Grant program on the CSM campus. His infectious laugh, energy, and commitment to student opportunities will be greatly missed as he heads into retirement (but hints that he has some great ideas for future collaboration on student projects).



You know how significant participation in Space Grant was to your career. You can make the Space Grant experience possible for today's students! Every monetary gift, no matter the amount, directly effects the life of a student by supporting student stipends or project supplies. Most gifts are tax deductible and you can leverage your gift through matching donations from your employer.

To sponsor COSGC students you can send a check, donate online, or make a gift by phone at: 1-800-405-9488

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2014 EVENTS

JANUARY
25 Robotics/Balloon Workshop

MARCH
TBD ALL-STAR CubeSat Launch

APRIL
5 Colorado Robotics Challenge
12 BalloonSat Payloads Launch
19 Colorado Undergraduate Space Research Symposium

JUNE
14-19 RockOn! Workshop
19 RockSat C Launch

JULY
28-31 COURSE Summer Bridge

AUGUST
2 BalloonSat Payloads Launch
12 RockSat-X Launch

SEPTEMBER
12-13 COSGC Annual Meeting

OCTOBER
9-11 Western Regional Meeting
25 Robotics Workshop

NOVEMBER
15 BalloonSat Payloads Launch

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