

COLORADO COMMUNICATOR



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

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Our Community. Our Family.

How does Colorado Space Grant consistently facilitate high quality hands-on projects for over 500 Colorado post-secondary students on campuses across the state each year? It takes a community.

Robots that can autonomously navigate a field of fine, blowing sand while avoiding natural and human made obstacles. Research exploring how to maintain high mirror reflectivity in the

presence of ambient particles and vapors for high sensitivity laser sensors. High altitude cosmic radiation experiments. Orbiting spacecraft that perform tropospheric temperature sounding for observation of sea ice/open ocean boundaries. Theoretical physics projects exploring swarm behavior. Verifying data gathered by the Kepler mission using local community observatories and Colorado's dark, rural skies. These are all challenges taken on by Space Grant students at Colorado institutions of higher education in the Colorado Space Grant Consortium.

Our students are talented and motivated. Our faculty are educated and committed. However, the hundreds of COSGC projects that

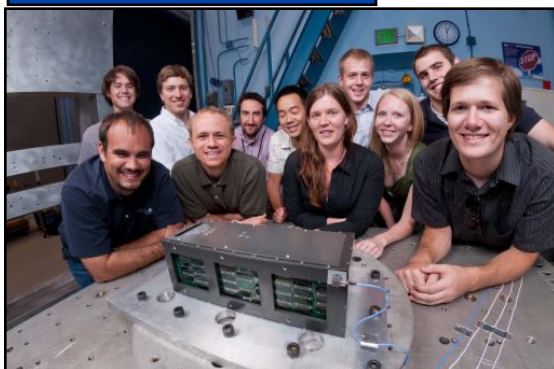


Transfer students touring the GJ Makerspace in Grand Junction as part of their welcome to CMU from CMU Space Grant.

have been accomplished would not be possible without the community of people who support the efforts. This community provides expertise, testing facilities, funding and most of all TIME.

Beginning on the college campuses where COSGC faculty and students reach out to others in various departments. On every COSGC campus are faculty and staff who support the program as mentors, research leaders, machine and electronics shop managers. There are those experts in the local community who step in to provide expertise when on-campus resources are unavailable. They are at MakerSpaces and small businesses and are sometimes adjunct faculty at community colleges. Then we have our industry and government laboratory partners who provide software licenses and training, lecture in COSGC classes, make testing facilities available to student projects,

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Students and mentors pose with the ALL-STAR satellite following vibe testing at Lockheed Martin.

COLORADO SPACE GRANT AFFILIATES

Adams State University (ASU)
George Sellman

Aims Community College (AiCC)
Lee McMains

Arapahoe Community College (ArCC)
Jennifer Jones

Colorado Mesa University (CMU)
Warren MacEvoy
Karl Castleton

Colorado School of Mines (CSM)
Angel Abbud-Madrid

Colorado State University (CSU)
Azer Yalin

Colorado State University Pueblo (CSU-Pueblo)
Jude DePalma

Community College of Aurora (CCA)
Victor Andersen

Community College of Denver (CCD)
Steffanie Peterson

Fort Lewis College (FLC)
Charlie Hakes

Metropolitan State University of Denver (MSUD)
Aaron Brown

Otero Junior College (OJC)
Joel Gray

Pikes Peak Community College (PPCC)
Liz Coelho

Pueblo Community College (PCC)
Joey Mathews

Red Rocks Community College (RRCC)
Barbra Maher

Space Foundation
Bryan DeBates

Trinidad State Junior College (TSJC)
Cindy Clements

University of Colorado Boulder (CU)
Brian Sanders

University of Colorado Colorado Springs (UCCS)
Steve Tragesser

University of Northern Colorado (UNC)
Matt Semak

Western State Colorado University (WSCU)
Suzanne Taylor



Director's Corner

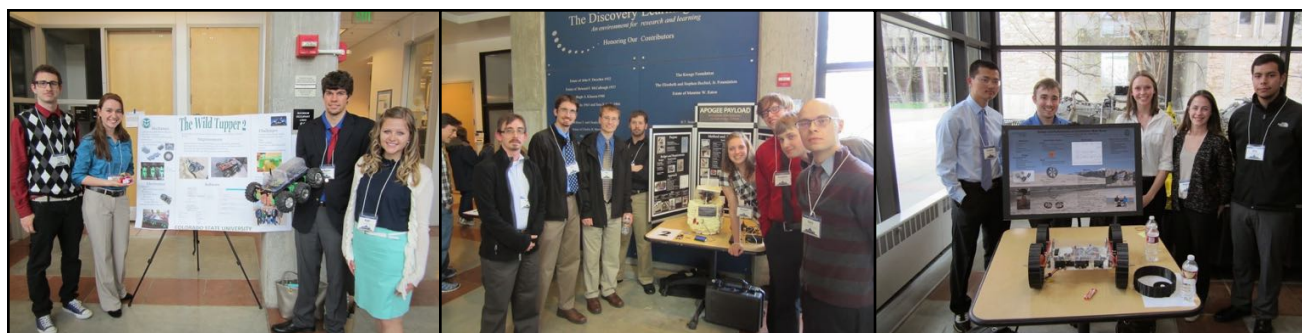
Greetings from Boulder, Colorado. 2015 was, as is typical for Colorado Space Grant, a very busy year. Even though we continue to operate at a reduced budget (this may change in 2016), we find our programs thriving. For example, participation in our statewide DemoSat program, which was started in 2002, continues to grow. In order to accommodate the number of balloon payloads in 2015, we had to do something never done in the history of our ballooning program - launch 3 balloons on the same day, carrying 23 student payloads to the edge of space. This occurred on April 11th, but not without a dash of drama, as the 3rd balloon was captured by a tree. However, with some quick action by our friends at Edge of Space Sciences, the balloon was rescued and re-launched with no damage to people, payloads, or flight string. So, in a way, we launched 4 balloons that day! Our Robotics Challenge at the Great Sand Dunes also attracted a record number of participants and observers this past April. The COSGC Undergraduate Space Research Symposium continues to showcase the great accomplishments of our students around the state. An unanticipated outcome of this annual events is that it is bringing our alumni back. Many of our judges, moderators, and even keynote speakers are former COSGC students. It means so much to me to see former students giving back to the COSGC program. It continues to amaze me each year, how much of an impact each of these statewide programs has on the students of Colorado.

Our Consortium has extended its reach over the past several years with the addition of new member institutions. Additional hands-on workshops and funding opportunities have helped many of our new and existing affiliates grow and expand their programs. Several of our affiliates have even added sounding rocket projects to their programs. Additional resources made available from a different grant allowed us to send 13 students and faculty from Colorado to the RockOn Workshop at NASA's Wallops Flight Facility as well.

There are many other highlights from 2015 and you can read about some of them in this very newsletter. However, I want to close the Director's Corner with a look to the future. For the first time in many years, it appears that the overall COSGC budget will rise in 2016. Due to our continued support from Congress, COSGC as well as every Space Grant in the country, is expecting an augmentation to base awards for the first time since 2011. COSGC, as well as the whole national program, was experiencing a long run of increasing budgets up until 2011, when our budgets were significantly reduced. Through partnerships and collaborations, as well as some thoughtful planning, COSGC has been able to maintain the Colorado program since then. Many programs (including the number of student participants) were reduced or eliminated. Now with the promise of additional funding, 2016 is looking like a time to restore programs and open our doors a bit wider for those students wanting to get involved. I am typically an optimistic person, but I am even more optimistic about this coming year. I strongly believe that COSGC is a great statewide program that makes a huge impact in the lives of many people. I am eager to enrich our existing programs and start supporting new ones in 2016 to increase that impact. If you are interested in offering your support (time, ideas, money, etc.) please let me know. Onward...



COSGC's annual Undergraduate Space Research Symposium was held April 18, 2015. 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 and Space Grant alumni. The Grand Prize winner was "Goal Oriented, Risk Mitigation Autonomous Behavior for Extraterrestrial Rovers" by Zachary Mimplitz (Colorado School of Mines - CSM). Session winners were Jeff Gier, Zachary Lund, Kristen Ossolinski, Ryan Russell (Colorado State University - CSU) with "CSU Balloon Payload"; Peter Merrick, Gerardo Pulido, Diego Gomes, Bryan Watson (University of Colorado, Boulder - CU) with "Volumetrically Efficient Cold Gas CubeSat Propulsion"; Dustin Clasby, Alexander Klein, Charles Bryan (Colorado State University-Pueblo) with "Sabatier Process Automation"; and Tessa Lowenstein (Pikes Peak Community College - PPCC) with "Polycyclic Aromatic Hydrocarbons and the Production of Infrared Radiation After Exposure to Ultraviolet Radiation in the Upper Atmosphere". The winner of the poster session was Jeremy Schwartz (University of Northern Colorado) with "Studying the Trajectory of the Human Foot's Center Pressure" and the hardware demonstration was Kelli Demny, Michael Bloom, Marshall Rawley, Taylor Morton, Dylan McNamara (CSU) "Wild Tupper 2 Robot". The Most Interdisciplinary prize was awarded for both the paper and poster to "Atmospheric data collection, radio transmission, and radiation barriers via high altitude weather balloon" by Wesley Hileman, Melinda Bradley, Joshua Connolly, Peter Garate, Cory Ross, Matthew Hileman, Jack Hetherington, and Jonathon Davidson (PPCC).



Jennifer Jones - faculty ArCC
 Jamie Principato - ArCC
 Robert Belter - ArCC
 Philip Baranowski - CCA
 Gregoria Olivas - CCA
 Jason Garcia-Coque: CCA
 Andrew Mezich: PPCC
 Eliot Anderson: OJC
 Larabeth Vanek: OJC
 Anton Pantorra: OJC
 Samuel Kincaid: RRCC
 Sara Vigil: RRCC

Affiliate Updates



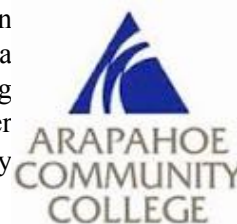
Space Grant at Adams State University (ASU) facilitates various autonomous robot projects for ASU undergraduate students. This past year, students explored high entropy alloys and spectrophotometers in their designs. Students demonstrated their robots at the 2015 Colorado Robotics Challenge on April 4th. ASU students support community robotics efforts - helping facilitate STEM Saturday Workshops on the ASU campus, supporting the House MakerSpace in the Alamosa School District and the San Luis Valley STEAM Shop Makerspace. ASU students and faculty also participate in the Robotics Society where citizens of all ages from the community explore robotics applications.



Space Grant at Aims Community College is one of the four new COSGC affiliate institutions. Aims Space Grant is part of the Applied and Environmental Technologies program. In the first year of the program, Aims students have participated in the statewide DemoSat program - building high altitude balloon payloads. Teams have included post-secondary students, as well as students who are concurrently enrolled - earning their high school diploma while also earning credits toward an associates degree at Aims. Aims student, Alicia LaForce, won a summer 2015 internship at Colorado State University, through the Colorado Community College Expansion program, funded by a COSGC grant from NASA.



Arapahoe Community College is also one of the four newest COSGC affiliate institutions. ArCC Space Grant followed up the January 2015 training workshop with a team of 7 students designing and launching a balloon payload on the April 11 DemoSat launch. The team wrote and presented a paper at the 2015 Colorado Space Grant Undergraduate Space Research Symposium. Two ACC students participated in the 2015 RockOn Workshop at NASA's Wallops Flight Facility in June 2015 in preparation for ACC to participate in a collaborative sounding rocket mission with 2 other COSGC community college programs.



Affiliate Updates

Space Grant at Colorado Mesa University (CMU) continues to facilitate exciting robotics opportunities for CMU students. The CMU robot made it to the Finals of the DARPA Robotics Challenge. The team traveled to California with the GRIT robot in the summer of 2015. CMU students can participate in robotics projects in various ways - including courses and extracurricular projects. CMU robotics students engage



the wider community by mentoring local FIRST robotics and FLL teams and in summer VEX robotics workshops. CMU students also design and facilitate activities at the Annual Math Extravaganza, which is a way to recruit students from the wider community into CMU mathematics and computer science programs.

Space Grant at Colorado School of Mines (CSM) is part of CSM's Center for Space Resources. CSM student, Zachary Mimplitz, won grand prize at the 2015 Symposium for his single author paper exploring autonomous robotics. A CSM Space Grant team competed in the NASA Robotic Mining Competition in May 2015 at Kennedy Space Center. Students in the CSM EIPCS design class, built and launched a high altitude balloon payload that explored the use of regolith as radiation shielding as part of the spring 2015 DemoSat flight in April.



COLORADO SCHOOL OF MINES



Space Grant at Colorado State University - Fort Collins (CSU) facilitated various projects for CSU undergraduate and graduate students. Projects included two teams of summer interns - one of which built a high altitude balloon payload with an experiment that explored vertical profiles of CO₂, and another team that worked on the development of a mobile, open-path cavity ring-down spectroscopy experiment. CSU Space Grant facilitated soldering workshops for the Society of Women Engineers (SWE) and Society of Hispanic Professional Engineers (SHPE) CSU chapters. There were three CSU teams that worked on autonomous robots - demonstrating them at the 2015 Colorado Robotics Challenge on April 4th. Two CSU teams brought home awards from the 2015 Undergraduate Space Research Symposium, including one of the robotics teams that won the demonstration session and the balloon payload team that won a paper session prize. Finally, CSU Space Grant sponsored a senior design team that participated in the Annual Intercollegiate Rocket Engineering Competition (IREC). This team won an award at CSU E-days in addition to winning the award for design innovation at the IREC.



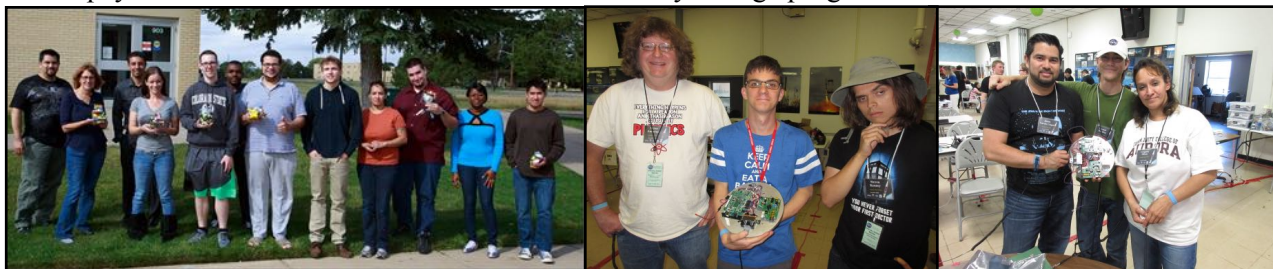
Affiliate Updates



Space Grant at Colorado State University - Pueblo (CSU-Pueblo) sponsored two student projects. First, students worked on automation of the Sabatier Reactor, a multi-year project CSU-P students have developed on campus exploring making fuel for a return trip from Mars. The team submitted and presented a paper at the 2015 Undergraduate Space Research Symposium and won top honors in their session. A CSU-Pueblo team also designed a robot that competed at the 2015 Colorado Robotics Challenge at the Great Sand Dunes National Park on April 4th.



Space Grant at Community College of Aurora is continuing to teach the Experimental Design Course where students design, build, and launch high altitude balloon payloads. This year marked the first Intro to Engineering Workshop and Robotics Course. CCA teams participated in the Colorado Robotics Challenge. Five CCA students attended the RockOn Workshop at NASA's Wallops Flight Facility in preparation of participating in the first collaborative COSGC sounding rocket payload mission with 2 fellow COSGC community college programs.



Space Grant at Community College of Denver (CCD) continues to have an active balloon payload program that flew multiple payloads in both academic and summer semesters. Eight CCD students built autonomous robots for the 2015 Colorado Robotics Challenge in April 2015. CCD also facilitated a sounding rocket mission that launched a student payload in June 2015 as part of the national RockSat-C program. CCD Space Grant students engaged the wider community by facilitating activities for middle school students in an annual Rocket Day - where they work with students on rocket-themed activities.



Metropolitan State University of Denver (MSUD) Space Grant facilitated two robotics teams at the Colorado Robotics Challenge and one team at a national robotics competition in Texas. An MSUD student completed a research project exploring thermal analysis with a faculty mentor. Finally, an MSUD team is building a payload that will fly on the June 2016 RockSat-X launch at Wallops.



Affiliate Updates



Space Grant at Fort Lewis College (FLC) sponsored student teams that designed, built, and launched balloon payloads for both academic year and summer semesters. FLC Space Grant students

also designed and built robots and competed at the 2015 Colorado Robotics Challenge. In addition,

students worked with faculty on astronomy research utilizing the local observatory and taking full advantage of the dark skies of Durango, CO. FLC Space Grant students also help maintain the observatory.



Otero Junior College (OJC) is another of the newest COSGC affiliate institutions. OJC students and faculty participated in the January 2015 balloon payload workshop. OJC affiliate director and faculty determined there was more interest in

robotics and so as their introductory Space Grant project, sponsored a student team that designed and built a robot for the Colorado Robotics Challenge. Three OJC Space Grant students participated in the RockOn Workshop at NASA's Wallops Flight Facility. Interest in balloon payloads has resurfaced on campus and the OJC Space Grant program plans to support both balloon payload and robotics teams during the second year with the Consortium.



Space Grant at Pikes Peak Community College (PPCC) continues a robust balloon payload program every spring semester on the PPCC campus. The balloon payload program not only provides a unique opportunity for students, but is the stepping stone to other exciting opportunities. Three PPCC Space Grant students applied and were accepted into the NASA Community College Aerospace Scholars Program (Peter Garate, Josh Connolly, and Jack Hetherington). Six graduating students were accepted into the COSGC

Transfer Program and were awarded scholarships to their new 4-year institutions. PPCC Space Grant students were recognized for their balloon payload research projects at the 2015 COSGC Symposium - Team Apogee won the Best Interdisciplinary project award and Tessa Lowenstein won



PIKES PEAK
COMMUNITY COLLEGE

top honors in her session for her single author research paper.

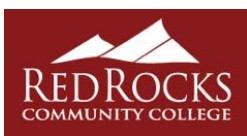


Affiliate Updates

Pueblo Community College (PCC) Space Grant became an official part of the new PCC STEM (Science, Technology, Engineering, and Mathematic) Center. Prior to the move, PCC Space Grant effectively engaged mainly machining technology students in robotics and balloon payload projects. Inclusion in the STEM Center is an effort to engage a wider number of disciplines on the PCC campus in Space Grant opportunities. This past year, in addition to



facilitating a robotics project, PCC Space Grant hosted 2 statewide workshops, including students and faculty from 6 COSGC campuses.



Red Rocks Community College is another of the newest members of the Colorado Space Grant family. In its first year as a COSGC affiliate, students completed a complex research project utilizing samples gathered by students at Death Valley, CA and flew on two separate balloon payloads. The project resulted in multiple poster and paper presentations across the country. RRCC Space Grant continues balloon payload projects and has added both a robotics project for the 2016 Challenge in addition to being part of the collaborative rocket payload that will launch in June 2016.



The Space Grant program at the Space Foundation continues to support training for pre- and in-service teachers in Colorado. The Space Foundation provides Space Across the Curriculum teacher professional development courses in the summer. Teachers can also apply for the Teacher Liaison program. Teacher Liaisons are extraordinary educators who use space-related education programs and principles in the classroom to act as advocates for space-based education in their schools and districts. They receive additional training and resources. Both of these programs also connect educators with one another across the country and world.



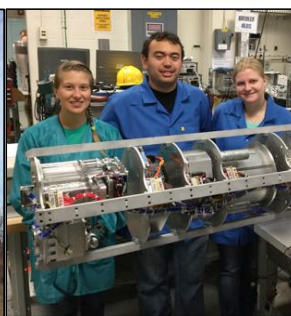
Affiliate Updates



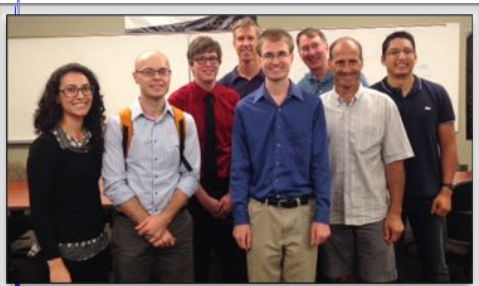
Trinidad State Junior College Space Grant sponsored a team for the Robotics Challenge in addition to facilitating a team that flew a biological payload on the April 2015 DemoSat launch. TSJC Space Grant provides courses to engage students in projects including a 3D Drawing and Printing Class and a Robotics Class. Faculty and students have engaged the wider community to recruit students by showing off their projects at community events including farmers markets and parades. In addition community members support TSJC student project as mentors.



Space Grant at University of Colorado at Boulder (CU) sponsored various student projects including the continuation of the PolarCube CubeSat mission (including command and mechanical testing on a microgravity flight), a follow-on to a CU senior design project called PropSat exploring propulsion for CubeSat payloads; the launch of the RocketSat-10 payload exploring the combining of Aluminum and Indium in microgravity; 2 long-duration balloon payloads in the HELIOS and SIMBA missions which completed solar observations and attempted the collection of stratospheric microbes respectively; taught the Gateway to Space class in the fall and spring semesters for over 120 CU students (launching 18 balloon payloads); supported 2 student teams that built autonomous robots that competed at the 2015 Colorado Robotics Challenge on April 4th; continued the development of a mobile S-band ground station and the ground station capabilities within the CU Space Grant facility on CU main campus; and continued the EduSourcing program placing students in internships with Digital Globe and Lockheed Martin.



University of Colorado at Colorado Springs (UCCS) Space Grant continued student research on human movement and efficiency. In addition, a student team continued a collaboration with the US Paralympic team, designing a wheelchair lift for a Paralympic athlete. Finally, UCCS Space Grant helped welcome 5 transfer students to the UCCS campus as part of the COSGC Transfer Program. This effort included identifying faculty members in each of the disciplines into which students were transferring who were interested in engaging talented students in research projects. All transfer students not only completed their degrees at a 2-year institution, but all of them also had project experience from past COSGC balloon payload missions.



Affiliate Updates

UNIVERSITY of NORTHERN COLORADO



Space Grant at University of Northern Colorado facilitates various student projects including autonomous robot projects, high altitude balloon payloads, and theoretical physics research. UNC DemoSat teams explored high altitude radiation effects on carbon nanotubes.



The UNC robotics teams built a robot for the COSGC Robotics Challenge in addition to completing the development of various sensors for robotics applications and designing a quadcopter. Physics research included posture control and swarm behavior investigations.

Western State Colorado University (WSCU) Space Grant sponsored a team of students that competed at the Colorado Robotics Challenge in April 2015, demonstrating their robot at the Great Sand Dunes National Park. In addition, WSCU Space Grant students worked



with faculty in astronomical research projects utilizing the Gunnison Valley Observatory. WSCU affiliate director, Suzanne Taylor is developing a WSCU freshman orientation course that focuses on building and launching balloon payloads.



**WESTERN STATE
COLORADO UNIVERSITY**
Learning. Elevated.

Sounding Rocket Successes



RockOn 2015 participants busy at work.

2015 marked the eighth year of the RockOn! Workshop at NASA's Wallops Flight Facility (Wallops). RockOn is facilitated by Colorado Space Grant Consortium (COSGC) Director, Chris Koehler, who developed the workshop in partnership with Wallops and the Virginia Space Grant Consortium. RockOn! provides educators from across the country with experience and resources to implement student rocket payload projects at their home institutions.

The RockOn! experience led to the formation of the RockSat-C (Canister) initiative, developed by Chris Koehler and Wallops. The RockSat "Canister," provides a standard payload volume and weight for launch on a sounding rocket for relatively low cost. Building on the success of RockSat-C, Chris and the Wallops team developed RockSat-X (RockSat-eXtreme). The RockSat X payload deck is a modular system built around decks; however, student payloads have

access to a rocket with an ejectable skin and nose cone that exposes experiments to the space environment fully at apogee. In addition, the X rockets are de-spun to allow for greater range of experiments. Not only have RockOn!, RockSat-C, and RockSat-X programs engaged thousands of faculty and students from around the country, they have provided incredible opportunities for COSGC students across the state. *continued on next page*

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CCA students and faculty show-off their group challenge results at the 2015 RockOn Workshop.

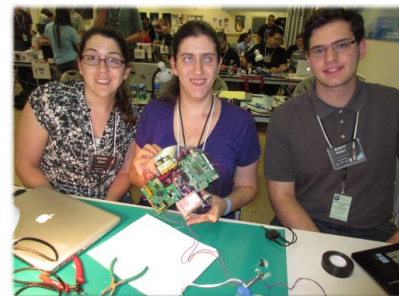
COSGC affiliate directors recruit additional students and lead the team through development, build, and testing through the fall and spring semesters. The team then travels to Wallops for launch - June for RockSat-C payloads and August for RockSat-X.

Both the RockSat-C and -X national programs are managed by Space Grant students on the CU campus. Project managers work with Chris Koehler and Wallops engineers in addition to facilitating reviews for students teams throughout the project. Managers work with Wallops engineers and student teams to coordinate test and and integration efforts at Wallops the week prior to launch.

In addition to incredible student experiences, these rocket programs have established partnerships with industry and government labs. The cost of sounding rocket projects exceeds NASA Space Grant support. Teams must raise additional funds to complete their projects through launch and to support student teams traveling to Wallops for testing, integration, and launch. The best approach is to connect with a sponsor interested in the payload experiment and/or looking for hardware demonstrations in the space environment.

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, visit <http://spacegrant.colorado.edu/national-programs>



RockOn participants from Arapahoe Community College show off their completed payload.



(top) 2015 RockSat X students and faculty at launch and posing for a group shot; (bottom) 2015 RockOn workshop participants and RockSat C students and faculty pose for a group picture following launch.

Statewide Balloon Payload and Robotics Program Updates



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

The first of these is DemoSat. Four short-duration balloon payload launches took place as part of the DemoSat program last year. Students participated in mission reviews and launches. A total of 37 undergraduate payloads flew (representing 15 COSGC institutions) on four 2015 DemoSat balloon flights in April, August, and November. Students work in teams either enrolled in courses (at CU, CCA, MSUD) or as extracurricular projects (at PPCC, CU, WSCU, CCD, PCC, FLC, CCA, CSM, UNC, CSU, AiCC, ArCC, RRCC). Launches are provided by Edge of Space Sciences at various rural eastern Colorado locations.

The 9th annual Colorado Robotics Challenge was held on April 4, 2015. Eighteen student teams representing 12 COSGC institutions (TSJC, WSCU, CSM, CSU-Pueblo, CU, OJC, CCA, FLC, UNC, CSU, ASU, PCC) gathered in the early morning to demonstrate their autonomous robots' capabilities, attempt to get through challenges including fine blowing sand, rocks of all sizes, dry vegetation, trenches, and human made obstacles and compete for Lego trophies and bragging rights. 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. The 2016 Challenge is scheduled for April 16th. Visit <http://spacegrant.colorado.edu/statewideprograms/robotics-challenge> for more information.



STUDENT FOCUS

This past year, COSGC engaged 563 Colorado students in space hardware missions, classes, and research projects, about which you have read on the preceding pages. Introducing them all to our readers would take a newsletter all its own (an extremely thick one). Instead, we present a sample 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.

Sara Vigil is a sophomore at Red Rocks Community College where she is working toward an associate of science degree. Sara worked on two high altitude balloon payloads in the spring and summer 2015 semesters. In June of 2015 she attended the RockOn Workshop at NASA's Wallops Flight Facility, where she worked with a team to build and launch a sounding rocket payload (pictured right). Sara is currently a member of the COSGC Collaborative RockSat-C payload mission, which will launch in June 2016. Sara plans on transferring to a 4-year institution where she will earn a bachelors degree and go on to graduate school.



Ryan Fabian is a junior at the University of Northern Colorado (UNC) studying physics with an emphasis in astronomy. Ryan transferred to UNC from Front Range Community College. Ryan has worked on 3 balloon payloads and is currently project manager for the most recent UNC Space Grant balloon payload mission. He has also mentored a high school balloon payload team. Ryan would like to establish a sounding rocket payload project at UNC Space Grant focusing on a June 2017 launch with the RockSat X program. Ultimately, Ryan plans on going on to graduate school and continuing to further his education as a way to contribute to his family which includes his wife and four children.



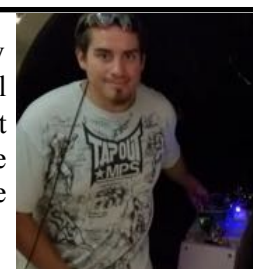
Megan Wilbanks is a senior at Colorado State University (CSU) majoring in engineering science with an aerospace concentration. Megan began her undergraduate years as a physics major at the University of Oregon and transferred to CSU in fall 2014. In spring 2015, she was part of a CSU Space Grant team that built an autonomous robot, for which she helped design the wheel and internal gear system. Megan was then accepted into a summer internship at CSU where she helped design and build a Schlieren Imaging system used to visualize the flow pattern of gasses. Megan plans to finish her bachelors degree and then work in the aerospace industry in the design, analysis, and production of flight hardware.



Robert Rothschild is a sophomore general engineering student at Fort Lewis College (FLC). In spring 2015 Robert worked on an FLC Space Grant team that designed and built an autonomous robot for the Colorado Robotics Challenge. He then joined a team that designed, built, and launched a high altitude balloon payload in August 2015. He is currently working on a balloon payload where his focus is on the payload structure and designing the system to gather gamma radiation data and record it during flight. Robert is considering graduate school and would like to work in the aerospace industry.



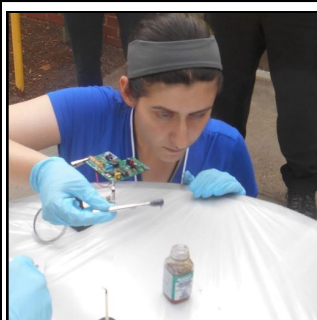
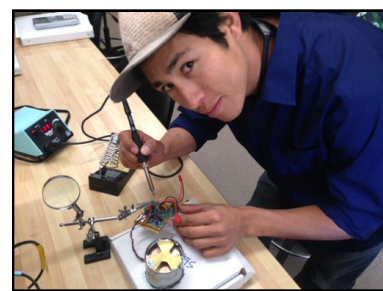
Matthew Romero is a junior in mechanical engineering at Colorado State University (CSU). Matthew worked on two autonomous robot teams that competed at the annual Colorado Robotics Challenge in April 2014 and 2015. He is currently the project manager of a balloon payload designing a system to provide realtime telemetry during the entire flight. Matthew would like to go to graduate school and ultimately work in the aerospace industry.





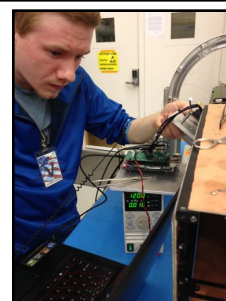
Tepora Su'a is a senior at Western State Colorado University (WSCU) where she is majoring in chemistry with minors in mathematics and physics. Tepora first joined the Space Grant family in 2013 when she worked on a balloon payload that did an *eColi* experiment. In 2014, she joined the team designing an autonomous robot for the Colorado Robotics Challenge. Tepora was recruited to help design a balloon payload project that could be used as freshman orientation course project. In fall 2015, she was the TA in the course. Tepora is currently working on her 2nd robotics team, working toward demonstrating their robot in April 2016. She also is president of the WSCU Chemistry Club, where among other things she helps with the annual “magic” show (pictured right). Tepora hopes to go on to graduate school and would like to do research in inorganic chemistry or alternative energy.

Eric Hicks is a senior in general engineering at Fort Lewis College (FLC). Eric was project manager for the FLC Robotics team that won best obstacle avoidance honors at the 2015 Colorado Robotics Challenge with their robot, REBECCA. He has also worked on FLC Space Grant teams that built and launched high altitude balloon payloads that flew an electric field mill. Eric plans to get a job in industry either in robotics or studying atmospheric electricity.



Jamie Principato is a sophomore at Arapahoe Community College working toward an associates degree in physics with a minor in mathematics. Jamie was on the first Arapahoe balloon payload team that flew a comprehensive radiation observation payload. She also worked on the second Arapahoe payload that demonstrated mechanical system for collection of stratospheric biological samples. Jamie is currently working on the collaborative Colorado Community Colleges sounding rocket payload team. She is working with a student at another institution developing the radiation experiment. After completing her bachelors degree, Jamie plans to continue to graduate school and pursue an academic career in theoretical physics.

Franklin Hinckley is an MS/BS student in aerospace engineering at the University of Colorado at Boulder (CU), focusing on astrodynamics and satellite navigation. Franklin joined the Space Grant family working on the ground station capabilities at the CU Space Grant facility. He went on to work on the DANDE satellite and ALL-STAR CubeSat missions in systems and operations. He is currently the avionics systems engineer for the PolarCube Cube Sat mission. Franklin plans on graduating with an MS and continuing to work on satellite components and integration as he moves into industry.



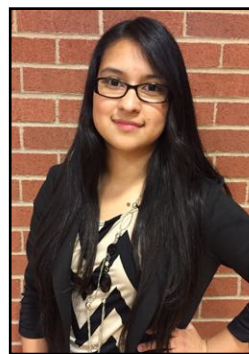
Alicia LaForce is an engineering technology sophomore at Aims Community College (Aims). Alicia was part of the first Space Grant balloon payload team, as she was one of the students who was in the how-to workshop that welcomed Aims as a COSGC affiliate institution. Alicia followed up her Aims project by being accepted into a summer internship at Colorado State University. At CSU, Alicia was part of a team that designed a payload that released a probe during descent. Alicia is back in the Aims balloon payload program where she is project manager of a mission that plans to deploy a rover after landing. Alicia plans to transfer to a 4-year institution for both a bachelors and masters degree in mechanical engineering.

Lev Seyferman is a sophomore at Red Rocks Community College (RRCC) working toward an associate of science degree. Lev plans on transferring to Colorado School of Mines to major in biochemical engineering. Lev is the project manager of the RRCC Space Grant balloon payload team. Lev began working mainly with communications and system integration, eventually working on the biological experiment - working with the specimens and facilitating testing. Lev is also working with the RRCC team that is part of the Colorado community college sounding rocket payload collaboration working toward a June 2016 launch. Lev plans to complete a bachelors degree and is considering graduate school. Ultimately, he would like to work at a laboratory in research and development.



Reeanna Brown is a junior in general engineering with a specialization in mechatronics and industrial engineering at Colorado State University - Pueblo (CSU-Pueblo). Reeanna joined the Space Grant family as a team member on an autonomous robotics project at CSU-Pueblo Space Grant. Reeanna was accepted for an internship with Lockheed Martin and credits the skills honed in her Space Grant experience as the primary reason Lockheed offered her a position (they were very interested in hearing about her project work). Reeanna is currently working on another robotics team working toward competing at the 2016 Colorado Robotics Challenge. After completing her bachelors degree, Reeanna plans to continue a career with Lockheed Martin.

Ben Holland is a junior at the Colorado School of Mines where he is in the combined engineering physics and mechanical engineering program. He initially joined the Space Grant family as team lead of a high altitude balloon payload that flew a cosmic radiation experiment in November 2014. Ben went on to spearhead a proposal team designing a mission to request NASA Science Mission Directorate funding (still pending). He currently is helping establish an makerspace on campus as president of a "DIY" electronics club. Ben plans to continue on to a masters degree in mechanical engineering before moving into industry to work on propulsion systems.



Flor Gordivas is a junior in electrical and computer engineering at the University of Colorado at Boulder (CU). Flor joined the Space Grant family when she participated in how-to workshops learning the basics of soldering and Arduinos. She went on to work on a team that built and launched a balloon payload in April 2014. Flor was recruited to help coordinate the RockOn Workshop at NASA's Wallops Flight Facility, which she has done for two summers. Flor was also on the sounding rocket mission team for RocketSat-10 payloads that launched in June 2015, worked with the student team on the HELIOS IV long-duration balloon payload that launched in August 2015, and is currently the lead on the RockOn 2016 coordination team. Flor plans to complete her bachelors degree and would like to work in the aerospace industry on a space exploration mission.

Ryan Cutter is a junior at University of Colorado at Boulder working toward a BS in aerospace engineering. He became part of the CU Space Grant family after taking the Gateway to Space course as a first year student. Ryan began working as a team member on the HELIOS IV long duration balloon payload mission. He eventually became the HELIOS IV project manager. Ryan is currently an attitude and control system engineer on the PolarCube satellite mission. His plan is to work in the aerospace industry following graduation and eventually go back to school for a graduate degree.



WHERE ARE THEY NOW?

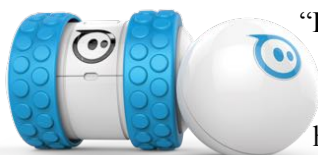
Hundreds of COSGC alumni remain part of the Space Grant family. Alumni continue to contribute to student projects as they move on to their careers in STEM fields in industry or as STEM educators. Our alumni are project mentors, guest lecturers in classes, reviewers, judges for the Symposium, advisory board members, and even making financial contributions to the program.

Adam Wilson joined the Colorado Space Grant family while earning mathematics and physics degrees at the University of Northern Colorado (UNC) in Greeley. Adam was always interested in robotics. UNC Space Grant had a strong robotics program and was constantly reaching out to recruit talented and interested students. Adam became intrigued with improving robot designs from previous years as he continued through his degree programs. While a Space Grant student, Adam helped teach a robotics course and helped develop an internet controlled robot called Odin. UNC mathematics courses and faculty challenged Adam and provided him opportunities to explore things that intrigued him such as discrete mathematics and spherical harmonics. Adam participated in the College of Natural Health Sciences (NHS) Research Celebration on the UNC campus where he had the opportunity to hone his research skills and show-off his work.



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Upon graduating in 2010, Adam began raising funds with Sphero co-founder, Ian Bernstein and connected with Techstars Boulder. The idea was to create a robot that could be controlled with a smartphone. Starting with an app-enabled robotic ball developed by Ian and Adam, Sphero became a reality. Adam was in charge of software. As the company took off, Adam began to work on special projects and research and development. Throughout 2014 and 2015, Adam worked on the Star Wars licensed BB-8 Droid. He is currently project manager for one of the upcoming products which has yet to be made public.



“Participating in Space Grant projects taught me how to “get dirty” and make inexpensive prototypes,” Adam explains. “I learned how to speak in public which is extremely important if you want to raise money for a startup. Space Grant also helped me realize I could accomplish enormous tasks if working with the right group of people. Finally, being near other amazing students at Space Grant events, who put their lives into great projects as students, was motivating and inspiring to me and my team as we worked on our own projects.”



Emily Brisnehan (Walters) first became part of the Space Grant family when she took the Gateway to Space class as a first year aerospace engineering student at University of Colorado at Boulder (CU). “I built one balloon satellite and I was hooked!” Emily explains. Her sophomore year, she joined a balloon payload team on which she worked on design, system integration, and testing - having the chance to work on a “little bits of everything.” Emily then joined the first COSGC RocketSat team as the science team lead. She was in charge of working all the science experiments and integrating them, “which is very similar to what I do now,” Emily continues. “Even though the rocket carrying our payload crashed into the desert, it was an amazing experience.” Emily was selected for an internship at NASA’s Jet Propulsion Laboratory to work on a Mars mission with other Space Grant students from across the country. The team wrote a proposal for a secondary payload for a Mars rover mission. She was in charge of designing the thermal subsystem. “That internship experience provided good thermal experience, so once I was back in Colorado, I became the thermal team lead for the DANDE satellite mission.” Emily graduated before DANDE launched, but she was able to work from the start of the design through part of integration and testing.

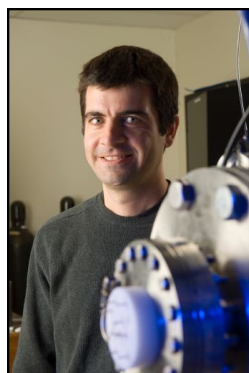
Emily graduated from CU in 2009 with a BS in aerospace engineering. She was hired at Lockheed Martin and while working earned an MS in mechatronic systems engineering at University of Denver (DU). While at Lockheed Martin, Emily worked on ALTO (assembly, test, launch operations) and systems for GRAIL, GOES-R and GPS. She is currently the payload systems engineer for the OSIRIS-REx program. The OSIRIS-REx mission will study an asteroid for a year, take a sample, and then return the sample to Earth. Emily is in charge of integration of half of the instruments of the spacecraft. “I work with the scientists and engineers to make sure that the science will work successfully.”

“Space Grant was extremely important to my education and to my being hired at Lockheed Martin. It helped with my first job because I had already worked on several satellite missions by the time I graduated.” Emily compares her work now to the experiences she had while an undergraduate student working on Space Grant projects. “Much of the work that I did at Space Grant, is similar to the work I do now. Space Grant gave me good exposure to the many subsystems and the entire timeline of a satellite mission. I would be at a very different place in my career without the experiences Space Grant provided.” Emily continues to give back to the Space Grant program as a mentor for current student projects. She also guest lectures in the Gateway to Space class at CU and reads and scores papers for the Symposium and does day-of judging whenever possible.



(l to r) Emily in the cleanroom at Lockheed Martin working on the OSIRIS-REx spacecraft; a picture of Emily in her early Space Grant days, with her Gateway to Space team, getting ready to launch their payload

Affiliate Director Snapshots



Dr. Azer Yalin is the affiliate director of the Space Grant program at Colorado State University (CSU) in Fort Collins where he is a professor in the mechanical engineering department. He took over the program when the former director retired in 2007. Azer studied engineering physics at Queen's University in Kingston, Canada (where he grew up). He then went to graduate school at Princeton where he earned MS and PhD degrees in mechanical and aerospace engineering. Azer's PhD work was on laser diagnostics of plasmas. At CSU Azer's research includes laser induced plasma and laser ignition, optical diagnostics, and sensors to measure trace gases in the atmosphere. He has developed the CSU Space Grant program to provide various levels of projects for CSU students, including robotics projects, short-duration high altitude balloon payload missions, and various engineering projects. Students also work with Azer on aspects of his own research. "I stepped in to lead CSU Space Grant because I knew of the great things Paul Wilbur [former affiliate director] was doing and thought it would be an interesting opportunity," Azer explains. "I enjoy seeing the amazing projects that students come up with," he shares when asked about his favorite aspects about Space Grant. "The other thing is getting the opportunity to travel around the state and meet people who are doing great things with students at other institutions." When away from work, Azer loves spending time with his wife, daughters, and family. He is an avid outdoor enthusiast enjoying skiing, mountain biking and traveling.



Liz Coelho is the affiliate director of the Space Grant program at Pikes Peak Community College (PPCC) in Colorado Springs. She took over the affiliate directorship of the PPCC Space Grant program in March 2012. Liz is the PPCC Astronomy Department Chair. She has a BA in astronomy from Boston University and an MS in astronomy from San Diego State University. Liz was able to participate in hands-on activities throughout her education. As an undergraduate, she helped maintain astronomy lab equipment and helped facilitate weekly Star Parties for the public. In graduate school, Liz studied galactic and extragalactic novae, mostly in the H-alpha band. She was able to make observations with a 40-inch reflector at Mount Laguna Observatory and with a 2.3 meter telescope at Kitt Peak Observatory. Since taking over the leadership of the PPCC program, Liz has developed a robust balloon payload program on the PPCC campus. Her



Liz (2nd from left) posing with students at the recovery of their just landed balloon payload.



Liz (left) representing COSGC with students at Aerospace Day at the Capital.

approach to student recruitment and engagement and program facilitation has become an example for her peers at other Colorado Space Grant institutions across the state. Liz has represented the COSGC program at state and national venues including the Western Regional Space Grant Directors meeting and at the recent Aerospace Day at the Capital. Liz is an avid mountain biker and Colorado Springs affords great trails! She has also trained in Brazilian Capoeira for ten years. Liz continues to facilitate programs for PPCC students and participate in telecons and discussions with the COSGC family to provide her unique approach and lessons learned to help other COSGC programs be successful. "I love the hands-on nature of Space Grant," Liz explains. "It is so empowering for students."

continued from cover

Our Community. Our Family.

read and score research papers, provide funding and mentors, and sometimes even serve in the role of “Customer” - providing science and/or hardware for student missions. All of these partners are untiring advocates for the program and spread the word about COSGC’s programs throughout industry, academia, and even at the state and federal levels. COSGC students give back to the wider community as they earn their degrees and complete challenging projects. Before enriching Colorado’s aerospace, science, and technical workforce as skilled and educated graduates, they are student engineers and scientists in COSGC programs, who facilitate hands-on activities for K-12 students, provide content for local math and science centers, facilitate tours and activities for their home institutions’ recruiting efforts and more. Every member of the COSGC community is a cherished member of the Space Grant family and integral to the continuing success of our student programs.



(l to r) Edge of Space Sciences volunteers prepare a balloon for attachment to the flight string carrying student payloads at an early morning launch; alumni judges and moderators pose at the 2015 Symposium; TSJC student robotics team with faculty and mentors at Challenge.

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.

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2016 EVENTS**JANUARY**

- 7 - 8 Balloon Payload Workshop
- 30 Robotics Workshop

APRIL

- 9 BalloonSat Payloads Launch
- 16 Colorado Robotics Challenge
- 23 Colorado Undergraduate Space Research Symposium

MAY

- 15-21 Eclipse Program Workshop

JUNE

- 18-23 RockOn! Workshop
- 23 RockSat C Launch

JULY

- 16-22 Eclipse Program Workshop

AUGUST

- 6 BalloonSat Payloads Launch
- 9 RockSat-X Launch
- 20 Eclipse Program Balloon Launch
- TBD HASP Launch

SEPTEMBER

- 16-17 COSGC Annual Meeting

OCTOBER

- 22 Robotics Workshop

NOVEMBER

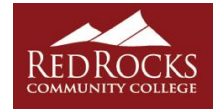
- 12 BalloonSat Payloads Launch



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