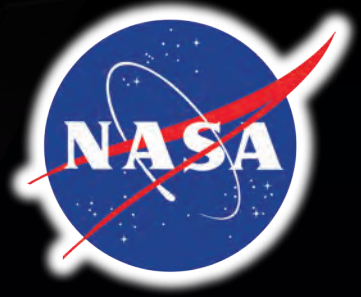


NASA

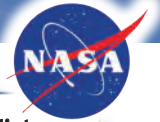


**National Space Grant
College and Fellowship Program**

Celebrating 25 YEARS



Charleston, South Carolina, October 2013



| SG Consortium | Director | Lead Institution | # of Affiliates |
|----------------------|--------------------------|---|------------------------|
| Alabama | John C. Gregory | The University of Alabama in Huntsville | 18 |
| Alaska | Denise Thorsen | University of Alaska Fairbanks | 7 |
| Arizona | Timothy D. Swindle | The University of Arizona | 32 |
| Arkansas | Keith Hudson | University of Arkansas at Little Rock | 26 |
| California | John Kosmatka | University of California, San Diego | 28 |
| Colorado | Chris Koehler | University of Colorado, Boulder | 17 |
| Connecticut | Thomas Filburn | University of Hartford | 23 |
| Delaware | Dermott J. Mullan | University of Delaware | 15 |
| Florida | Jaydeep Mukherjee | University of Central Florida | 21 |
| Georgia | Stephen Ruffin | Georgia Institute of Technology | 17 |
| Hawaii | Luke Flynn | University of Hawaii at Manoa | 12 |
| Idaho | Joe Law | University of Idaho | 21 |
| Illinois | Philippe H. Geubelle | University of Illinois at Urbana-Champaign | 12 |
| Indiana | Barrett S. Caldwell | Purdue University | 25 |
| Iowa | Ramanathan Sugumaran | University of Northern Iowa | 21 |
| Kansas | Leonard Scott Miller | Wichita State University | 8 |
| Kentucky | Suzanne Weaver Smith | University of Kentucky | 21 |
| Louisiana | John P. Wefel | Louisiana State University | 26 |
| Maine | Terry Shehata | Maine Space Grant Consortium | 20 |
| Maryland | Richard Conn Henry | The Johns Hopkins University | 12 |
| Massachusetts | Jeffrey Hoffman | Massachusetts Institute of Technology | 20 |
| Michigan | Alec D. Gallimore | University of Michigan | 12 |
| Minnesota | William Garrard | University of Minnesota - Twin Cities | 14 |
| Mississippi | Peter C. Sukanek | University of Mississippi | 16 |
| Missouri | Fathi Finaish | Missouri University of Science and Technology | 11 |
| Montana | Angela Des Jardins | Montana State University | 19 |
| Nebraska | Scott E. Tarry | University of Nebraska at Omaha | 18 |
| Nevada | Christian H. Fritsen | Nevada System of Higher Education | 15 |
| New Hampshire | Antoinette (Toni) Galvin | University of New Hampshire | 9 |
| New Jersey | Haim Baruh | Rutgers University | 13 |
| New Mexico | Patricia Hynes | New Mexico State University | 15 |
| New York | Yervant Terzian | Cornell University | 22 |
| North Carolina | Christopher S. Brown | North Carolina State University | 17 |
| North Dakota | Santhosh Seelan | University of North Dakota | 19 |
| Ohio | Gary L. Slater | Ohio Aerospace Institute | 26 |
| Oklahoma | Victoria Duca Snowden | The University of Oklahoma | 14 |
| Oregon | Jack Higginbotham | Oregon State University | 19 |
| Pennsylvania | Christopher House | The Pennsylvania State University | 15 |
| Rhode Island | Peter Schultz | Brown University | 12 |
| South Carolina | Cassandra Runyon | College of Charleston | 19 |
| South Dakota | Edward F. Duke | South Dakota School of Mines & Technology | 19 |
| Tennessee | Alvin M. Strauss | Vanderbilt University | 15 |
| Texas | Wallace Fowler | University of Texas at Austin | 51 |
| Utah | Joseph Orr | University of Utah | 19 |
| Vermont | Darren L. Hitt (Interim) | University of Vermont | 15 |
| Virginia | Mary Sandy | Old Dominion University | 14 |
| Washington | Robert M. Winglee | University of Washington | 14 |
| West Virginia | Majid Jaridi | West Virginia University | 20 |
| Wisconsin | R. Aileen Yingst | University of Wisconsin - Green Bay | 41 |
| Wyoming | Paul Johnson | University of Wyoming | 12 |
| District of Columbia | Richard Berendzen | American University | 10 |
| Puerto Rico | Gerardo Morell | University of Puerto Rico | 18 |

Total Number of Space Grant Affiliate Members in 2013: 955

FOREWORD



In its wisdom the United States Congress established the Land Grant Colleges in 1862 which revolutionized agricultural sciences. A parallel program was established in 1966 called the National Sea Grant College, focusing on the nation's marine resources. In 1988 Congress established the National Space Grant College and Fellowship Program administered by NASA. The main aim of this program has been to support and enhance education and research in space-related fields, and prepare the future workforce for NASA.

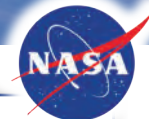
Space Grant is organized into 52 consortia: one in every state plus Washington D.C. and Puerto Rico. Each consortium has many affiliate members from within the state, composed primarily of colleges/universities, research institutions, science museums, industry, and state/local agencies. At present Space Grant has nearly one thousand members across the country. Consortia fund scholarships and fellowships for undergraduate and graduate students majoring in STEM (science, technology, engineering, and mathematics), and also support curriculum development and interdisciplinary research for faculty. Consortia also conduct outreach programs in their states and interact with secondary schools, such as providing STEM teacher workshops and hands-on activities for students. We see great value in preparing early explorers who grow into young scientists and engineers, and become our future high-tech leaders. We are all very proud when our students present their research, be it on an aeronautical engineering project, or on discoveries made by the Mars rovers, or on the discovery of habitable planets around other stars. Another major Space Grant effort provides funding for the best and brightest young men and women to intern at NASA Centers. Hundreds of such internships have been very successful in attracting and motivating students into aerospace and technology careers.

NASA's Space Grant Program is celebrating 25 years of existence, with remarkable successes and enthusiasm for the future. There are scores of dedicated individuals who deserve thanks for Space Grant's successes – these include all past and present consortia Directors, Program Coordinators, and staff; Space Grant Managers and Education Leaders at NASA Headquarters; and members of Congress who understand the values of STEM education and support our nation's efforts in aeronautics and space exploration. The basic structure of the program is well-established. Celebrating 25 years is a major achievement, but the challenge for the future is to continue encouraging young students to excel in STEM, prepare them for the needed STEM workforce, and create superb space and technology leaders. We also need to expand the program to reach all the remote corners of our country, and include more underrepresented students who have not had opportunities to experience and contribute to exciting developments in aeronautics and space exploration. There are countless discoveries waiting to be made for the benefit of humanity.

This commemorative book contains brief descriptions of all 52 NASA Space Grant consortia and includes student research highlights. Special thanks to Erica Miles, the Associate Director of the New York Space Grant Consortium, who assisted with preparation of this document.

HAPPY 25th BIRTHDAY, NASA SPACE GRANT!

Yervant Terzian
Chair, National Council of Space Grant Directors
Director, New York Space Grant Consortium
Tish Distinguished University Professor, Cornell University



MESSAGE FROM THE ASSOCIATE ADMINISTRATOR

Congratulations on celebrating 25 years of helping NASA engage America's students in science, technology, engineering and mathematics. What an impressive milestone!

When I think about the future of NASA exploration, I know that having a strong, STEM-literate workforce will be key to our success. Space Grant is helping to lay the foundation for that workforce through the hard work that you, your colleagues and your students are performing every day. I continue to be impressed by the diversity of your programming, the reach of your activities, and the sustained legacy of the Space Grant investment.

Just to cite a recent example, newly selected astronaut Jessica Meier is a former Rhode Island Space Grant scholar – and now she is poised to take American human space exploration farther into the solar system! This is just one example of how NASA Space Grant contributes to the STEM pipeline, but I know that there are thousands of others. In speaking with Space Grant students over the years, it is very clear that their passion and drive is going to continue to shape research, industry and STEM education. From current and future researchers to those who take advantage of professional development as educators, together we are working to meet the need for a strong, national STEM education effort.

Once again, congratulations – and thank you – for all that you have accomplished. I am eager to see what the next 25 years have in store.

Sincerely,

Leland D. Melvin
NASA Office of Education



MESSAGE FROM THE DIRECTOR, NATIONAL SPACE GRANT COLLEGE AND FELLOWSHIP PROGRAM, NASA

I am delighted to be joining the NASA Space Grant team in this momentous year of your 25th anniversary celebration. Each and every one of you deserves to be acknowledged and congratulated for the tireless work and passion that is put into your programs. NASA Space Grant has been absolutely critical to the NASA Education portfolio, contributing to the reach, specialization and impacts in STEM education.

In accordance with Agency and Presidential priorities, the role of Education in NASA has evolved over the years. This has included adding or shifting programs, projects and priority areas. It is very clear that Space Grant has been on the forefront of making wide contributions to these priorities with the range of programming offered to your students, faculty and pilot collaboration efforts. These key collaborations have included NASA Summer of Innovation, GLOBE, the Ralph Steckler Bequest, NASA Explorer Schools – the list goes on! Historical Space Grant contributions are also noted in past evaluations, data submitted to the office, as well as stories and recollections that I have been hearing from the Space Grant community and the NASA Program Office staff. Without question, the work you have done has been far-reaching and impactful.

But there is still more to do.

I look forward to working with all of you as we work to shape the future of NASA's contributions to STEM Education – not only for our professional lives, but for the opportunities we create to the future generation of STEM scholars and leaders. This is more important now than it ever has been, but I know that we are up for the challenge. Your history shows that you are up for the challenge, and have often led the charge in creating solutions. I am confident in what the future holds for the Space Grant community, because of all of you.

I know that I speak on behalf of the entire NASA Aerospace Research and Career Development (ARCD) team when I wish you all another 25 exciting years!

Sincerely,

Lenell Allen, Ph.D.
Director, ARCD



MESSAGE FROM THE DIRECTOR, STEM ENGAGEMENT,
NASA

The strength of the National Space Grant College and Fellowship Program lies in the networks that have been created and sustained over the past 25 years. Year-after-year you impact hundreds of thousands of lives – through the local projects you execute, to the development of your state-based consortia, to your support of students and faculty in national programs.

You have made a difference at every level of the education pipeline.

Unique in the realm of federal education programs, Space Grant provides NASA unparalleled access to and opportunities with every state plus the District of Columbia and the Commonwealth of Puerto Rico. From a start of 21 consortia with less than 100 affiliated institutions in 1990, you have built a network of 52 consortia with over 1,000 affiliated institutions.

Guided by the original enacting legislation of 1988, the core tenets of workforce development, interdisciplinary education programs, and collaborations among academia, industry and government have stood the test of time. You only need to casually thumb through this booklet to see the breadth and depth of the Space Grant programs and catch a glimpse of extraordinary accomplishments.

Let's celebrate the remarkable journey we have traveled together!

Warmest regards,

Diane Donielson DeTroye
Former Manager, National Space Grant
College and Fellowship Program



NASA/Alabama Space Grant Consortium



Consortium Description

The Mission of the Alabama Space Grant Consortium is to inspire, enable and educate a diverse group of Alabama students to take up careers in space science, aerospace technology and allied fields; to play our part in assuring U.S. leadership in space exploration and aerospace technology in the future; to inspire the next generation of space explorers; to bring increased realization of the value of space science and technology to the people of Alabama; and to insure that our message and our programs reach all constituencies in the population of Alabama, especially those traditionally under-represented in the science and engineering professions.

Summary of Alabama Space Grant Programs

Alabama Space Grant Consortium programs enhance opportunities for all Alabamians to participate in NASA STEM-related research, education, workforce, and public service programs. Key Alabama Space Grant programs include:

- Scholarships (Junior, Senior, Community College)
- Pre-service Teacher Education Scholarships
- Graduate Research Fellowships
- Internship opportunities at NASA Centers and industry
- Student research grants for hands-on, student-led activities
- Student balloon satellite, CubeSat, CanSat, Moonbuggy, Lunabotics and rocket programs
- Mini-grants to Alabama K-12 teachers for hands-on activities
- STEM teacher training and professional development programs for Alabama K-12 teachers
- Informal education activities that support STEM education

Lead Institution

- The University of Alabama in Huntsville

Affiliate Members

- Alabama A&M University (HBCU)
- Auburn University
- The University of Alabama
- The University of Alabama at Birmingham
- University of South Alabama
- Tuskegee University (HBCU)

Community Colleges

- Beville State Community College
- Gadsden State Community College
- Shelton State Community College (HBCU)

Government Liaisons

- NASA Marshall Space Flight Center
- The Alabama Mathematics, Science, Technology and Engineering Coalition for Education (AMSTEC)
- The Von Braun Center for Science and Innovation, Inc. (VCSI)

Education Outreach Partners

- U.S. Space and Rocket Center
- Sci-Quest Hands-on Science Center

Industrial Partners

- The Boeing Company
- Dynetics, Inc.
- Wyle Laboratories
- STI Electronics, Inc.
- ADTRAN
- Teledyne Brown Engineering
- ATK Aerospace Group



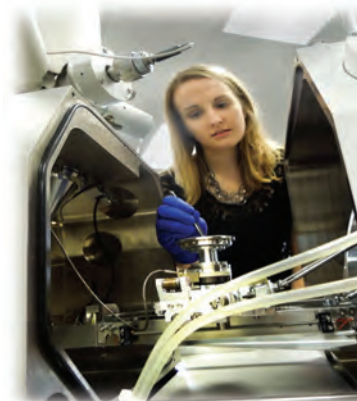
Student Research

Fabrication and Characterization of Functionalized Polymer Systems using Dip Pen Nanolithography

Carrie Ellen Schindler, Graduate Fellow, The University of Alabama at Birmingham

Biography

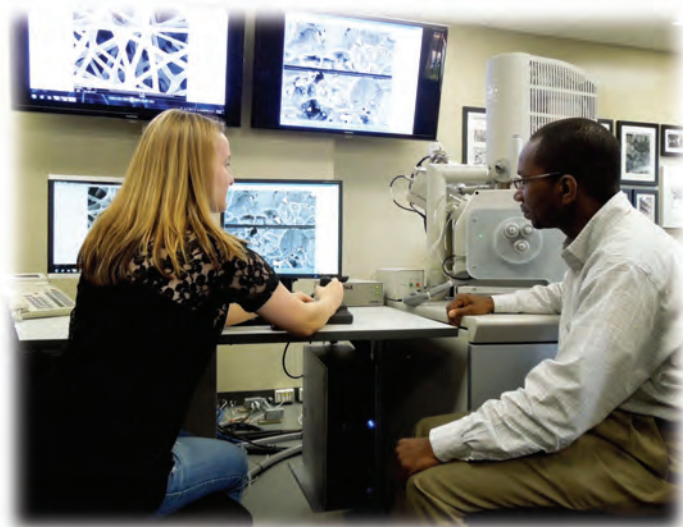
Carrie Schindler began her undergraduate career studying physics at the University of Evansville in Evansville, Indiana. She first visited The University of Alabama at Birmingham in 2008 through the National Science Foundation's Research Experiences for Undergraduates summer program where she worked under the tutelage of Dr. Derrick Dean in the Department of Materials Science and Engineering. She received her B.S. degree from the University of Evansville in May of 2010 and began her graduate career in the Fall of 2010 as a doctoral student in the Materials Science and Engineering Department at UAB. She was awarded a fellowship in 2012 from the NASA Alabama Space Grant Consortium to pursue her research entitled, "Fabrication and Characterization of Functionalized Polymer Systems using Dip Pen Nanolithography."



Ms. Schindler working on the Scanning Electron Microscope or SEM in the lab

Abstract

Electroactive polymers (EAPs) are recently gaining attention for their unique mechanical and electrical properties. This class of polymers is emerging due to its lightweight, ease of processing, durability, and mechanical flexibility which are attractive for aerospace applications such as the Space Launch System (SLS). However, there are several hindrances to the integration of EAPs into innovative disciplines. An inability to consistently characterize EAPs has posed a roadblock for the creation of a reliable database of electro-mechanical properties. In addition, a limited availability of inherent EAPs creates a lack of supply for mass production products. This study will focus on the development of a small-scale characterization technique using force-feedback data from the Dip Pen Nanolithography® platform. The reliable technique will facilitate the evaluation of the performance of inherent electroactive polymers compared to electro-mechanically enhanced nanocomposites. The Dip Pen Nanolithography® platform will be used to characterize the response time and sensitivity of the EAPs with a range of electrical stimuli.



Ms. Schindler and her advisor, Dr. Derrick Dean reviewing results

Follow Alabama Space Grant on:





Alaska Space Grant Program

The Alaska Space Grant Program is a consortium of public and private universities and non-profit organizations that sponsors a broad range of programs to enhance teaching, research, and educational outreach within aerospace and earth science, and other NASA related STEM disciplines throughout Alaska.

The Alaska Space Grant Program provides the conduit for education, and the development of a knowledgeable workforce and research infrastructure in support of NASA’s mission.

Specifically our mission is:

To promote Earth and Space Science and technology and other NASA relevant teaching, research, and public service throughout Alaska, with special emphasis on culturally responsive programs to engage native, minority, and non-traditional communities.

Goal 1: We are committed to engaging and creating ACCESS for all students and faculty in the state of Alaska to Alaska Space Grant Program’s NASA related research and education opportunities. We will accomplish this through (i) the development and strengthening our relationships with Alaska’s community colleges and rural campuses; and (ii) the development of distance education and summer opportunities targeted at increasing enrollment in STEM disciplines.



Goal 2: We are committed to supporting research and educational opportunities that are RELEVANT to NASA’s mission and the states needs. We will accomplish this by providing (i) opportunities for authentic, hands-on student experiences in science and engineering; and (ii) research infrastructure development opportunities that enhance the collaboration between Alaska faculty and NASA scientist and engineers.

Goal 3: We are committed to enhancing PERMANENT connections between NASA’s mission, and Alaska students, faculty, and citizens. We will accomplish this through supporting (i) opportunities that prepare our students for permanent employment at NASA or other aerospace industries; (ii) NASA related sustainable research infrastructure opportunities; and (iii) opportunities that enable the permanent incorporation of NASA educational materials in the states STEM curriculum.



Lead Institution

University of Alaska Fairbanks
Web: spacegrant.alaska.edu

Academic Members

Alaska Pacific University
University of Alaska Anchorage
University of Alaska Southeast
College of Rural and Community Development

Non-Profit Members

Challenger Learning Center of Alaska
Juneau Economic Development Council

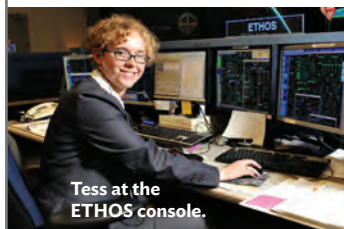


Alaska Space Grant Program

Five Years, One Rocket, Zero Gravity

A success story begun with the Alaska Space Grant by **Tess Caswell**

Data streamed from space onto the monitors before me, detailing the minutia of the environmental and thermal systems of the International Space Station. The room in which I sat was silent but for the hum of computers, yet the steady buzz of conversation in my headset belied the quiet evening in Mission Control; though the crew slept soundly 240 miles above our heads, the flight control team stayed busy monitoring the station in which they lived. The routine evening was about to become more interesting; in this deluge of data spanning five monitors, one of the plots had a steady, downward trend.



Tess at the ETHOS console.

That night I was responsible for the Environmental and Thermal Operating Systems (ETHOS) console in Mission Control, and the slowly

dwindling number was a leaking tank of calibration gas for the mass spectrometer monitoring air quality within the Station. With each passing hour it lost two months' worth of gas and, with it, our ability to routinely verify the spectrometer's readings. Time was short and stopping the leak required waking the crew on a Saturday night, but it was a problem readily fixed. Here, my time with the Space Grant came into play; noticing the leak, then working with both astronauts and fellow flight controllers to fix it, required skills cultivated during my years with the Alaska Space Grant Program (ASGP).

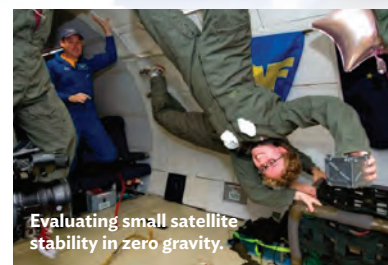
Many of the lessons that prepared me for those moments in Mission Control began at the University of Alaska Fairbanks (UAF) where, under the guidance and support of ASGP, my undergraduate education took

shape. After five years with the program I had launched a sounding rocket 100 km above the Earth and floated in the weightless environment of NASA's Reduced

Gravity Aircraft, conducting experiments designed and built by our team at UAF (*above*). I had learned to interpret data in real-time and to make changes on the fly to meet objectives. And I'd learned that the difficult phase of an experiment is not the test itself but the hours, days, and weeks of preparation leading up to it. These and countless other lessons prepared me for multiple internships and a career right out of college, when I joined United Space Alliance in Houston, TX, and became a Flight Controller for the International Space Station.

The Space Grant laid the groundwork for this path to NASA. Through the Student Rocket Project I gained technical experience, worked under government oversight for the first time, and cultivated leadership skills while simultaneously constructing a complex experimental apparatus for a single, all-or-nothing test. In Reduced Gravity I learned to develop an experiment from a hypothesis and to see it through from beginning to end, incorporating lessons learned and making improvements to increase scientific return on subsequent flights.

The Alaska Space Grant Program, through applied knowledge in the context of ASGP projects and real-time support of the ISS, formed the backbone of my undergraduate education and a successful early career.



Evaluating small satellite stability in zero gravity.



The fifth mission of the Alaska Student Rocket Project, SRP-5, launches from Poker Flat Research Range in Alaska.

Arizona Space Grant Consortium



Consortium Description

AZSGC activities span the sixth largest state. We sponsor strategically integrated programs that incorporate research with education to help build a diverse, scientifically literate citizenry and a well-prepared STEM workforce. The marriage of public and private research/development with education, benefits society by nourishing the workforce development pipeline from those exploring science for the first time, to those traditionally under-represented in these fields, to university students making career choices, to members of the public who want to apply the latest NASA research and technology to life problems.

Workforce development has been AZSGC’s highest priority since grant inception. Since 1990, AZSGC has provided 229 Graduate Fellowships and 2263 mentored internships. 1913 members of Arizona’s university faculty and public/private research sectors directly benefited from integrating smart, motivated students into their research enterprises. Since 2006 alone, 607 awardees have taken “next steps”. Of these, 540 students--89%--joined the NASA, aerospace, STEM academic or STEM workforce or are pursuing additional STEM degrees, a significant contribution given our state’s, NASA’s and Nation’s unprecedented need for human capital in these areas.

AZSGC Programs

- **Graduate Fellowships:** Outreach focused to “Bring NASA to Arizonans”
- **Mentored Research Internships:** Launch students into top graduate programs and the STEM workforce
- **Research:** Student flight and team programs give opportunities in NASA-focused research and design
- **Precollege:** Focus on under-represented/under-served and train teachers to be better STEM educators
- **Informal Education:** Bridge the gap between Earth systems science, geospatial technology and societal needs

MEMBERS:

- The University of Arizona (Lead)
- Arizona State University
- Northern Arizona University
- Embry-Riddle Aeronautical University

AFFILIATE PARTNERS:

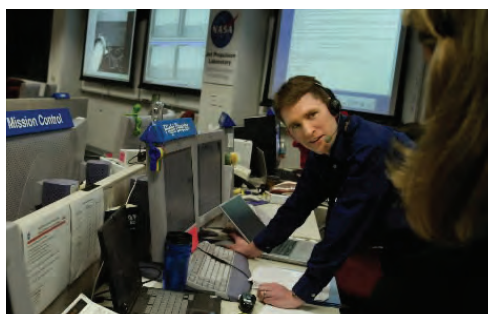
- Arizona Daily Star
- Arizona Daily Sun
- Arizona Near Space Research
- Biosphere 2
- Coconino Community College
- Diné College
- Flandrau Science Center & Planetarium
- Glendale Community College
- International Dark-Sky Association
- Iridium Satellite LLC
- Lowell Observatory
- Mt. Lemmon SkyCenter
- NASA Jet Propulsion Laboratory
- National Optical Astronomy Observatory
- National Undergraduate Research Observatory
- Orbital Sciences Corporation
- Paragon Space Development Corporation
- Pima Community College
- Planetary Sciences Institute
- PM & AM Research
- Prescott Astronomy Club
- QinetiQ North America
- Raytheon Corporation
- Rincon Research
- South Mountain Community College
- Tohono O’odham Community College
- USDA ARS SW Watershed Research Center
- USGS Flagstaff and Tucson branches

Website: spacegrant.arizona.edu

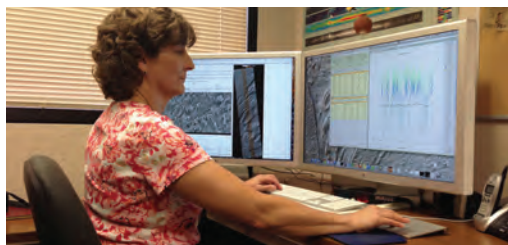


Arizona Space Grant Consortium

Space Grant students work in a broad range of fields--from astronomy to Earth science, from engineering to working as science writers at Arizona's largest newspapers. Our graduates are employed working on national science policy in Washington, D.C, and writing for Space.com. During the Space Grant years, two major NASA missions have operated out of Arizona, and many others have had key Arizona involvement. Most have had intimate ties with AZSGC. The Phoenix Mars Lander (Mars Scout program) included 1993 AZSGC intern, Chris Lewicki (*above*), as the NASA MER's Impact/Egress team Flight Director responsible for successfully "valet parking" Spirit and Opportunity and "handing the keys over to the science team". 25 AZSGC Interns and 2 Fellows worked on the mission. Chris is now President/Chief Asteroid Miner at Planetary Resources.



2005 Intern Stephanie Barnes (*right*) went to work for the Phoenix Mission with intelligence and enthusiasm but little background. By the time the spacecraft landed on Mars, she was an Instrument Sequence Engineer, responsible for sending signals to the Surface Stereo Imager on Mars. She now serves as a Science Operations Engineer for OSIRIS-REx.



Audrie Fennema (*left*), a 2000 Intern "bridging" from Pima Community College into The University of Arizona, completed degrees in Physics and Astronomy, and was hired to the Mars Reconnaissance Orbiter's HiRISE (High Resolution Imaging Science Experiment) camera team. She is now a senior staff technician.



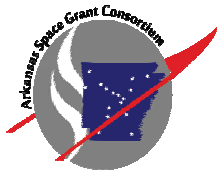
2002 Intern Angelita Denny (*above right*) is on the Diné Tribal College faculty and mentors students there.

The New Frontiers program asteroid sample return mission, OSIRIS-REx, scheduled to launch in 2016, has a 1992 AZSGC Intern, Dante Lauretta, as Principal Investigator (*right*). Dante also serves as a Space Grant Mentor and Steering Committee Member. To date O-REx has employed 11 Space Grant students.



Photo credit: Tucson Lifestyle Magazine

AZSGC recruits smart, motivated students, and provides opportunities that enrich Arizona's research enterprise and launch careers!



Arkansas Space Grant Consortium

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Fax: (501) 569-8039

Web Site: <http://asgc.ualr.edu/>

E-Mail: asgc@ualr.edu



Director:
Financial Coordinator:
Financial Coordinator:

Dr. Keith Hudson
Ms. Laura Holland
Ms. Kristi Wright

Background

The Arkansas Space Grant Consortium (ASGC) includes 17 four-year universities and colleges throughout Arkansas. Our primary goal is to educate and familiarize faculty, undergraduate and graduate students with aerospace fundamentals, and also, with NASA's broad research programs and other opportunities to enter aerospace and related industries. Following in NASA's footsteps, we conduct programs to familiarize and motivate K-12 students with the STEM related courses needed to enter aerospace activities at colleges and universities, and to enter high tech white-collar and blue-collar professions in high-tech industries.

Member Schools

- Arkansas State University
- Arkansas Tech University
- Harding University
- Henderson State University
- Hendrix College
- John Brown University
- Lyon College
- Ouachita Baptist University
- Southern Arkansas University
- University of Arkansas, Fayetteville
- University of Arkansas at Ft. Smith
- University of Arkansas at Little Rock
- University of Ark. for Medical Sciences
- University of Arkansas at Monticello
- University of Arkansas at Pine Bluff
- University of Central Arkansas
- University of the Ozarks

Partners in Aerospace

We are proud of our association with several organizations based in Arkansas, known to ASGC as "Partners in Aerospace". They provide expertise in their field, as well as input to the member campuses in providing research/education opportunities in aerospace to their faculty and students. They also provide this same expertise in our K-12/Outreach programs.

- Arkansas Department of Aeronautics
- Aerospace Education Center
- Arkansas Department of Education
- Arkansas Department of Higher Education
- Arkansas Science and Technology Authority
- BEI Systems & Space Division
- Civil Air Patrol – Arkansas Wing
- Arkansas Aerospace Training Consortium
- Arkansas Economic Development Commission

Programs

1. Research Infrastructure (Faculty) Grants

- Provide travel funds for visits to NASA, industry and university aerospace research facilities.
- Recipients are expected to mentor Student Scholarship/Fellowship research; add aerospace material to existing or new courses; submit proposals and papers and perform K-12 outreach.

2. Undergraduate Scholarships/Graduate Fellowships

- Provide travel funds for visits with faculty research centers.
- Recipients are expected to perform mentored research; assist mentors in preparation of reports, papers, and proposals; and perform college and K-12 outreach.

3. General Public (Guest Lecturer) Grants

- Provide travel funds & honoraria. Lecturers make presentations at 2 or more campuses.

4. K-12 (Outreach) Grants and Mini-Grant Program

- Provide funds for K-12 student space-related programs.
- Mini-Grants of \$500 and Outreach Grants up to \$5,000 are available for teacher professional development opportunities, small classroom projects, trips, and STEM related consumables.

5. Higher Education Grants

- BalloonSat/CubeSat research program bridging K-12 capabilities with University Research

6. Undergraduate Workforce Development Fellowships

- Provide funds to support research projects and NASA internships with the goal of increasing aerospace opportunities in Arkansas industries and university curricula.
- Recipients are expected to perform mentored research and spend at least one internship period at a NASA site.
- Awards are given annually to help support on-campus learning activities and NASA site internship expenses.

7. STEM/MSI Awards

- Provide funds to support underrepresented and/or underserved students in the initial phases of involvement in NASA related STEM areas of study.
- Recipients are expected to work with a mentor on NASA related research and make an Outreach Presentation to a K-12 group or at the annual Symposium.

8. Aeronautics Enhancement Program

- Provide \$2000 scholarships to students pursuing certificates for A&P mechanic and avionics technicians
- Funds a Aeronautics Research project at Henderson State University to a Aviation student

Revised 02/19/13



Progress

ASGC began operation March 1, 1990. In our operations to date, we have awarded 2,884 grants:

- 861 Research Infrastructure Grants
- 1,133 Undergraduate Scholarships
- 227 Graduate Fellowships
- 55 Workforce Development Fellowships
- 85 STEM/MSI Grants
- 27 A & P 2-Year Grants
- 76 General Public Grants
- 414 K-12 Grants
- 6 Higher Education Grants

As a result of these awards, a continually growing number of faculty and students have visited NASA centers to talk to NASA researchers. Many guest lecturers have spoken at public meetings to a total audience in excess of 7000 people. Outreach activities to K-12 schools have involved more than 9000 students.

Individual Honors

The Arkansas Workforce Development awarded 6 fellowships in Year 22. The Awardees are:

- Mr. Saad Amaz, UA at Little Rock
- Mr. Kristopher Buckholz, Henderson State University
- Ms. Haley Morris, AR Tech University
- Ms. Bukola Odeniya, UA at Little Rock
- Mr. Bryant Pierce, Henderson State University
- Mr. Zachary Pinson, Southern AR University

Collaborative Research Projects

Beginning March 1, 1995, ASGC instituted a new Collaborative Research Program. ASGC provides \$15,000 a year for each project, and we require participation of two or more campuses. Some matching funds are also required from the campuses, in support of collaborative research involving their faculty and students. Projects can be up to three years in duration.

In Year 22 of our grant we have five Collaborative Research Projects:

1. **Functionalization of Single-Walled Carbon Nanotubes for Highly Sensitive Gas Sensors**
PI: Dr. Jingbiao Cui, UA at Little Rock
Co-PI: Dr. Mansour Mortazavi, UA at Pine Bluff
2. **Toward a New Universal Density Profile for Dark Matter in Galaxies: Cusps versus Cores**
PI: Dr. Marc Seigar, UA at Little Rock
Co-PI: Dr. Abdel Bachri, Southern Arkansas University
3. **Electric Rover Used for Wide Area Biogas Detection**
PI: Dr. Kevin Lewelling, UA at Fort Smith
Co-PI: Dr. Edmond Wilson, Harding University
4. **New Approach for regulation of Stress Tolerance in Plants for Advance Life Support in Space Exploration**
PI: Dr. Mariya Khodakovskaya, UA at Little Rock
Co-PI: Dr. Vibha Srivastava, UA at Fayetteville

5. UV Photodetectors Using Zinc Nonorod Arrays

- PI: Dr. Hye-Won Seo UA at Little Rock
- Co-PI: Dr. Rayn Tian, UA at Fayetteville

NASA/EPSCoR Research Programs

The Arkansas NASA EPSCoR Program started in 1994. Since then Arkansas has competed and been awarded funding in every national competition. Since then Arkansas has been awarded \$9.8 million in research.

Arkansas NASA EPSCoR was recently awarded four grants for funding:

NASA/EPSCoR Research (Three Year Awards)

1. Research 2009 :
"Mobile Surveying for Atmospheric and Near-Surface Gases of Biological Origin"
Dr. Gary Anderson - UA at Little Rock
2. Research 2009:
"Photoconductive & Photovoltaic Arrays of Indium Sulfide Nanostructures."
Dr. Tansel Karabacak - UA at Little Rock
3. Research 2011:
"Functionalization of Nanomaterials for Photovoltaic Devices"
Dr. Omar Manaserh – UA at Fayetteville
4. Research 2012:
"New Computer Methods for NASA Robotic Planetary Exploration"
Dr. Cang Ye – UA at Little Rock

NASA Research Infrastructure Development (yearly)

1. "Towards a Better Understanding of the Nature of Dark Matter"
Dr. Marcus Seigar - UA at Little Rock
2. "A Broadband Energy Harvester for Wireless Sensor System in Spacecraft Structural Monitoring"
Dr. Guoliang Huang - UA at Little Rock
3. "The Effects of Microgravity on Coronary Artery Endothelial Cells Grown in HARV Culture Vessels"
Dr. Nawab Ali - UA at Little Rock
4. "Development of Critical Technologies for Formation and Proximity Flight with Nano-Satellites"
Dr. Adam Huang - UA at Fayetteville
5. "Development of Intermediate Band Quantum Wire Solar Cell for NASA Space Explorations"
Dr. Mansour Mortazavi – UA at Pine Bluff

Revised 02/19/13



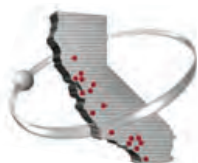
NASA/California Space Grant Consortium

Consortium Description

The California Space Grant Consortium (CaSGC) inspires & educates the next generation of aerospace scientists, engineers, and managers by bringing NASA’s aerospace-related content, technical expertise and application environment to California’s educational community and general public.

Our high quality fellowship, scholarship, research, higher education, precollege and outreach programs promote diversity and inclusion and are aimed to benefit California’s large and diverse population (over 38 million) preparing students for the Science, Technology, Engineering & Math (STEM) workforce.

We are comprised of 28 institutional affiliates from California’s three public higher education systems, private colleges and non-academic institutions and partner with industry and governmental institutions to best serve our students and stakeholders. Feedback and longitudinal tracking demonstrate our programs have a significant impact on students’ academics and careers.



Summary of CaSGC Programs

CaSGC programs provide high quality STEM aerospace activities targeting precollege to university level education and learning, research, workforce development and outreach. Programs include research and hands-on student activities in:

- **Aeronautics:** Unmanned Aircraft
- **Astronautics:** Launch Vehicles, Payloads, CubeSats, Planetary Landers & Near Space Ballooning
- **Robotics:** Underwater & Dynamic Tensegrity
- **Physical Sciences:** Environmental Science, Earth System Science, Remote Sensing, Global Climate Change, Space Science, Astronomy & Astrophysics
- **Outreach:** Engagement of STEM Middle-School Teachers, Summer STEM Opportunities for Secondary Students on College Campuses & Community College Engagement

[HTTP://CASGC.UCSD.EDU](http://CASGC.UCSD.EDU)  

Lead Institution

University of California, San Diego

Affiliate Members

- Astronomical Society of the Pacific
- Azusa Pacific University
- CalPoly – Pomona
- CalPoly – San Luis Obispo
- CalTech
- CSU Sacramento
- CSU San Bernardino
- CSU Long Beach
- CSU Los Angeles
- Fresno State
- Pomona College
- San Diego Community College District
- San Diego State University
- San Diego Supercomputer Center
- San Jose State University
- Santa Clara University
- Sonoma State University
- Stanford
- UC Berkeley
- UC Davis
- UC Irvine
- UC Los Angeles
- UC Riverside
- UC Santa Barbara
- UC Santa Cruz
- University of San Diego
- University of Southern California

Participating Community Colleges

- Cabrillo College
- Citrus College
- Hartnell College
- Los Angeles City College
- Mt. San Antonio College
- Napa Valley College
- Santa Barbara City College
- Southwestern College

Governmental Engagement

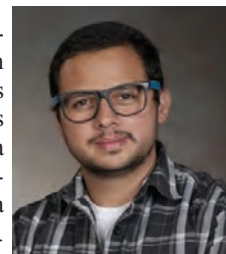
- NASA Dryden Flight Research Center
- NASA Ames Research Center
- NASA Jet Propulsion Laboratory



NASA/California Space Grant Consortium

Student Research: Javier Gonzalez-Rocha, California State University, Sacramento

Growing up in a farm worker family, I was encouraged to pursue education as a means to overcoming poverty and attaining a better quality of life. I was taught to value education as the only thing in life that no one else would be able to take away. My family's endorsement of my academic pursuits fueled my desire to achieve an exciting and challenging endeavor in life. Being cultivated with this notion and my fascination for flight and space exploration technologies compelled me to pursue a career fostering future developments in these fields, particularly the emerging field of systems dynamics and controls to transform flight and space exploration. My engagement with the California Space Grant Consortium began during my undergraduate degree and I am now about to join a Ph.D. program in Engineering.



Javier Gonzalez-Rocha

My interest in graduate school surged after working with Professor Jose Granda as an undergraduate student at California State University, Sacramento (CSUS) on a research project supported by the California Space Grant. The structural resilience of the International Space Station (ISS) needed to be assessed in its final stages of construction. To achieve this goal, I assisted two graduate students in simulating the dynamic characterization of the space structure under various dynamic load conditions. We worked long hours modeling various segments of the ISS and performing finite element analysis to generate predictions of failure modes, comparing them to those obtained by NASA engineers. This sparked my desire to gain more in depth knowledge about aerospace engineering and to pursue an advanced degree in the field.



Javier with interns at NASA Dryden

In 2010 I joined the MS program in Mechanical Engineering at CSUS. During this period, I deepened my understanding of aerodynamic mechanics and aeroelasticity while working with Professor Ilhan Tuzcu studying flight stability of an unmanned aircraft vehicle. This led me to co-author a technical paper in the SAE International Journal of Aerospace. Subsequently, I was supported by the California Space Grant to take part in the 2012 NASA Aeronautics Academy at Dryden Flight Research Center where I worked with nine other interns on the Primary Research Aerodynamic Design to Lower Drag (PRANDTL-D) Project. This project aims at obtaining a more birdlike flight and is led by the Associate Director of Research in the Research and Engineering Directorate, Albion Bowers.

Furthermore, as part of my Master's thesis I investigated a noble approach to dampening spacecraft vibrations through passive damping control. Active control of structures has long been a main focus of an immense number of studies in the literature. This is particularly true for large space structures due to their low natural frequencies and structural damping, and not being surrounded by an environment that can introduce an external source of energy dissipation. Nevertheless, all studies in this subject area focus on the control of elastic displacements without giving much attention to the dynamics corresponding to the thermal fields generated by these.

In our study, we considered a rod in transversal vibration and showed that control of both vibration and temperature can be achieved by heat input through thermoelectric actuators. Already, we have been able to obtain results that demonstrate the feasibility of using thermoelectric actuators to damp out vibrations as well as temperature. These findings will be presented at the 2013 ASME Dynamics Systems and Controls Conference at Stanford University.

Moving forward, I am starting a Ph.D. program in the Department of Aerospace and Ocean Engineering at Virginia Tech. In this new career phase, I would like to partake in interdisciplinary studies leveraging the field of system dynamics and control to advance the forefront of flight and space exploration technologies. Ultimately, I am interested in addressing nonconventional challenges involving the interplay of humans with highly automated systems. After completing my studies I will seek a research position in academia to continue to partake in the advancement of the aerospace field. Once I have matured as a researcher, I will pursue leadership roles to support STEM education initiatives in the United States. I feel my perspective and skills will offer alternative approaches toward strengthening the STEM pipeline and keeping our nation at the forefront of innovation.

COLORADO SPACE GRANT CONSORTIUM



Lead Institution:

University of Colorado,
Boulder

Affiliate Institutions:

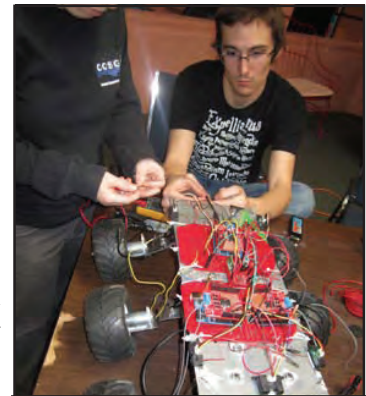
- Adams State University
- Colorado Mesa University
- Colorado School of Mines
- Colorado State University,
Fort Collins
- Colorado State University,
Pueblo
- Community College of Aurora
- Community College of Denver
- Fort Lewis College
- Metropolitan State University
- Pikes Peak Community
College
- Pueblo Community College
- The Space Foundation
- Trinidad State Junior College
- University of Colorado,
Colorado Springs
- University of Northern
Colorado
- Western State Colorado
University

The **Colorado Space Grant Consortium** (COSGC) leverages the excitement of our nation’s aeronautics and space programs to educate and develop America’s future technological workforce by engaging a diverse community of college and university students in real-world, hands-on projects including:

- CubeSat missions
 - Sounding rocket payloads
 - Short and long-duration balloon payloads
 - Autonomous robotics projects
 - Observatory research
 - Space-focused laboratory research
- ...all including faculty and industry mentors.

COSGC students have access to resources including a clean room; electronics, assembly, and integration labs, faculty research labs, a mission operations and control center, ground satellite tracking stations, observatories, robotics testing yards, as well as numerous partnerships with NASA Centers and industry.

The Space Foundation provides courses for pre- and in-service teachers through their Space Across the Curriculum courses. In addition, COSGC students and faculty engage in service by sharing their experience and expertise with the K-12 STEM community in established after-school and summer programs by partnering with state, national, and community organizations.





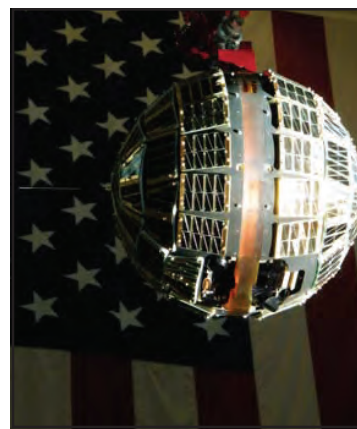
COLORADO SPACE GRANT CONSORTIUM



Student Research: The DANDE Satellite Mission

Since 1989, COSGC has focused its program on hands-on student research tied to real-world space hardware and missions. Starting with Get Away Special missions on the Space Shuttle from sounding rocket flights to balloons and robotics, COSGC has engaged thousands of students in these hands-on project. One such project is DANDE.

Drag induced by the neutral atmosphere is the major perturbation on satellites in low Earth orbit. True density deviates as much as 21% from model predication, introducing error into crucial government and private sector operations with applications to situational awareness, space surveillance, laser communications, re-entry prediction, rendezvous and proximity ops. A need exists to measure physical or “true” density, quantify density variations, and to provide in-situ model calibration data.



The Drag and Atmospheric Neutral Density Explorer (DANDE) is a low-cost density, wind, and composition measuring satellite that will provide data for the calibration and validation of operational models and improve our understanding of the thermosphere.

Students fulfill all team positions from subsystem team member, through team lead, systems engineers and project managers. A graduate student led the development of the project and wrote the proposal that won the award to get the DANDE mission on its way through the Air Force Research Laboratories' University Nanosat Program (UNP). Since DANDE began in 2007 the mission has engaged over 100 students (primarily undergraduate) from many disciplines including physics, applied mathematics, aerospace engineering, computer science, electrical engineering, mechanical engineering, astrophysics, interdisciplinary telecommunications, and engineering physics. Students have been supported by

COSGC alumni, faculty and industry mentors from University of Colorado College of Engineering and Applied Science, Air Force Space Command and the National Oceanic and Atmospheric Administration (NOAA).



In 2009, the DANDE team won the UNP 5 competition for a launch. Through 2012 and 2013 the student team has been completing environmental testing and preparing for mission operations. DANDE is scheduled to launch in 2013.



Consortium Description

The Connecticut NASA Space Grant College Consortium, is comprised of 13 higher education members. These academic members along with informal education partners and local industry support 3 major goals using NASA funding. These goals include establishing and promoting NASA-related research opportunities that draw on the collaborative strength of private, academic and government sectors, supporting education initiatives that will inspire students to pursue careers in science, technology, engineering and mathematics (STEM), and promoting workforce development that recognizes the current and future needs of the Connecticut economy.

Summary of CSGC Programs

- Undergraduate Research, Fellowships and Scholarships
- Graduate Research and Fellowships
- Community College Scholarships
- Industrial Internships, Summer and Academic Year
- NASA Academies
- Faculty Research (Seed, Curriculum Development & Collaborative)

Connecticut Specific Opportunities

Helicopter/UAS Workshop:

A week-long educational program open to the national Space Grant Consortia highlighting the Helicopter industry in our state.

National Industrial Internship Program:

Summer internships available at CT “aero” companies.

Educational Programs:

CCAT Teacher Workshop, Northeast Regional Teacher Workshop

Lead Institution:

University of Hartford

Affiliate Members:

- Central Connecticut State University
- Connecticut Colleges of Technologies
- Eastern Connecticut State University
- Fairfield University
- Southern Connecticut State University
- Trinity College
- University of Bridgeport
- University of Connecticut
- UConn Health Center
- University of New Haven
- Wesleyan University
- Yale University

Museum/Non-Profit Members:

- New England Air Museum
- CT Science Center
- Discovery Center Museum
- CT Invention Convention



CONNECTICUT SPACE GRANT CONSORTIUM

Student Research Spotlight:

Manuel Curillo, University of Bridgeport

“Space grant scholarships don’t just change one student’s life. They can inspire and change many lives”, said Dr. Jani Macari Pallis of mechanical engineering graduate student Manuel Curillo.

Born in Ecuador, Manuel came to the United States with his family as a child, living first in New York and then settling in Connecticut. He attended Danbury High School where he was an honor student before pursuing his undergraduate degree in Industrial Design at the University of Bridgeport.

After a joint meeting between the university’s School of Design and School of Engineering, Manuel approached Pallis (a faculty member in mechanical engineering and the university’s Connecticut Space Grant campus director) about the possibility of a graduate degree in mechanical engineering. “It wasn’t enough for me to just design the ‘outside’ of a product, I wanted to understand how it worked ‘inside’. I wanted to understand if my designs were structurally safe”, said Manuel.

To transition between his design degree and prepare for a graduate degree in engineering, Manuel took advanced mathematics and calculus, physics and an engineering mechanism design class as his electives for his industrial design degree. He even filled his summer with math classes at a community college. “I was so impressed with Manuel’s diligence, work ethic and desire to become an engineer, that I suggested he work with me on a NASA related project,” said Pallis. Subsequently, Manuel was awarded a Connecticut Space Grant Directed Scholarship and, along with Pallis, developed an infrastructure plan that would lay the foundation for the university to engage in NASA sponsored challenges – like the CanSat and Moonbug-

gy competitions. “Through Manuel’s work, participation in these NASA challenges will inspire and engage many students here”, said Dr. Pallis.

Manuel was accepted into the graduate program, began his master’s degree in Fall 2012 and now serves as Pallis’ graduate assistant.

Manuel is now working with Dr. Pallis on a CubeSat



mission. (CubeSat’s are small satellites used for space research). He is responsible for the creation of the physical satellite components used as models for development purposes. He is also working with Dr. Zheng (Jeremy) Li, an associate professor in mechanical engineering at the University of Bridgeport, on the

study and computational analysis of nanocoating technology applied to the NASA and US aerospace industry for product improvement including anti-corrosion, material enhancement, and self-lubricated enrichment. He is specifically responsible for new nanocoated material data searching, computer aided simulation and analysis on material enhancement. Dr. Li’s work is funded through a Connecticut Space Grant.

What’s next? “I hope one day I’ll work on helicopter or car designs”, smiles Curillo. “Also, I think we should take risks in live and never give up on our dreams.”

NASA/Delaware Space Grant Consortium

Consortium Description

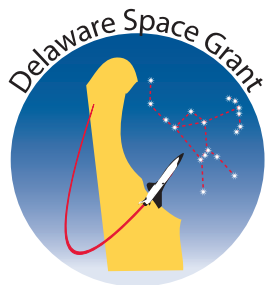
Delaware Space Grant's (DESG) long-term objective is to encourage students in the State of Delaware to consider careers in fields related to science, technology, engineering, and mathematics (STEM). Our goal is to provide financial support for the training of students in STEM-related academic programs at the undergraduate and graduate levels. DESG is also committed to aiding in the professional development of STEM-related educators at the precollege level so that independent of career choices, students in Delaware will be enriched with a broad understanding of science.

DESG provides support of the education and training of students and professionals, especially women, underrepresented minorities, and persons with disabilities, for careers in fields which will meet NASA's needs in the 21st century.

Summary of DESG Programs

DESG serves students and teachers in the State of Delaware in a variety of educational and training projects in areas which are related to STEM including:

- Graduate student fellowships
- Undergraduate tuition awards
- Undergraduate summer research
- Summer internships at NASA centers
- STEM teacher training and programs for K-12 students
- Summer workshops
- Industrial internships



NASA/Delaware Space Grant Consortium
 212 Sharp Laboratory
 Department of Physics and Astronomy
 University of Delaware
 Newark, DE 19716
 Phone: (302) 831-1094
 desgc@bartol.udel.edu
 www.delspace.org

Lead Institution:

**University of Delaware
 Newark Campus**
 Newark, DE

Affiliate Members:

Delaware AeroSpace Education Foundation
 Bear, DE

Delaware State University
 Dover, DE

**Delaware Technical Community College
 Owens Campus**
 Georgetown, DE

**Delaware Technical Community College
 Stanton Campus**
 Newark, DE

**Delaware Technical Community College
 Terry Campus**
 Dover, DE

**Delaware Technical Community College
 Wilmington Campus**
 Wilmington, DE

DuPont Company
 Wilmington, DE

ILC Dover LP
 Frederica, DE

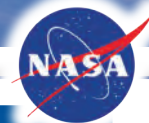
Swarthmore College
 Swarthmore, PA

**University of Delaware
 Lewes Campus**
 Lewes, DE

Villanova University
 Villanova, PA

Wesley College
 Dover, DE

Wilmington University
 New Castle, DE



NASA/Delaware Space Grant Consortium

Novel nanomaterial aimed to improve space suit safety

A. Kate Gurnon,
University of Delaware



Photo courtesy of Evan Krape,
University of Delaware Photography

Astronauts are exposed to many dangers in space, particularly debris encountered while working outside the spacecraft. Micrometeoroid and orbital debris (MMOD) are sub-centimeter sized particles that can travel up to 19 kilometers per second and have the potential to penetrate space suits [Christiansen, E.L. Handbook for Designing MMOD Protection. *Johnson Space Center Report* (2009)], placing astronauts at risk and sometimes forcing them to abort their mission. During the past two years as a NASA Delaware Space Grant Fellow, I have studied Shear Thickening Fluids (STFs), a novel nanotechnology comprised of nanoparticles in a carrier fluid that has the potential to dissipate energy upon an impact and improving the material's resistance to the imposed stress. This unique material can be incorporated into fabrics and shows promise to improve MMOD resistance in the next generation space suits while remaining flexible and durable.

Under the supervision of my advisors, Dr. Norman J. Wagner and Dr. John W. Gillespie, I have developed a new test method by combining large amplitude oscillatory shear (LAOS) rheometry and small angle neutron scattering (SANS) methods to understand the shear response and corresponding microstructure of STFs during a dynamic deformation, [A. K. Gurnon, *et al.* 'Measuring Material Microstructure under Flow Using 1-2 plane flow-Small Angle Neutron Scattering'. *Journal of Visual Experiments* (In-Press)]. This knowledge is relevant for understanding the response of STF-fabric nanocomposites during

hypervelocity impact and can help engineer STFs tailored to meet the challenges of operating in the environment of low earth orbit.

I am honored to be a NASA DESGC fellow, and I attribute the significant progress I have made in my research to the added financial flexibility the award afforded me. My first, first-author paper [A. K. Gurnon and N. J. Wagner. *J. Rheol.* 56, 333 (2012)] focuses on the development of constitutive models to predict the dynamic response of non-Newtonian materials undergoing LAOS. I have also presented my Space Grant-supported research annually at the national Society of Rheology (SoR) meeting as well as the International Congress on Rheology (ICR). As the Fraser and Shirley Russell teaching Fellow, I co-instructed the Introduction to Chemical Engineering course this past spring. Further, I am involved in K-12 and women's STEM outreach programs at UDel, during which I use my DESGC sponsored research for laboratory demonstrations.

Finally, this summer I am advising an undergraduate student in the Chemical and Biomolecular Engineering Department. We will focus on the dynamic material properties of STFs undergoing shear for composite material applications as I complete my doctoral dissertation. I am fortunate to have received the DESGC fellowship; it has given me opportunities to develop novel experiments, flexibility to attend conferences directly related to my research and the platform to communicate my work to other researchers and students who match my enthusiasm for research.



NASA/Florida Space Grant Consortium

CONSORTIUM DESCRIPTION

Serving a population of over 19 million and university and college enrollment of 1.1 million, the NASA/Florida Space Grant Consortium (FSGC) provides students opportunities for engaging in interdisciplinary hands-on activities to propel them to be leaders in space industry and innovative space organizations of tomorrow. FSGC's mission is to strengthen Florida's economy and augment NASA Educational Outcomes by providing space-related fellowships, scholarships, and internships; supporting research opportunities, and academic-NASA-industry partnerships; and enhancing STEM awareness, literacy, education and excellence in Florida's citizens, public and private educational systems, and workforce. The Consortium is a association of seventeen public and private Florida Universities and colleges, led by the University of Central Florida. The Consortium also includes Space Florida, the Kennedy Space Center (KSC) , the Astronaut Memorial Foundation and the Orlando Science Center.

SUMMARY OF FSGC PROGRAMS

- Graduate fellowships at universities
- Undergraduate scholarships
- Summer internships at NASA centers, Space Life Sciences Lab and industry
- Faculty research focused on NASA and KSC priorities
- Hands-on, interdisciplinary student projects
 - ◆ Student satellite design competitions
 - ◆ Student balloon and Rocket programs
 - ◆ Student experiments on ISS
- Curriculum development and course development grants
- Teacher training for Florida K-12 teachers focused on NASA topics
- After-school hands-on education activities in science museums

LEAD INSTITUTION:

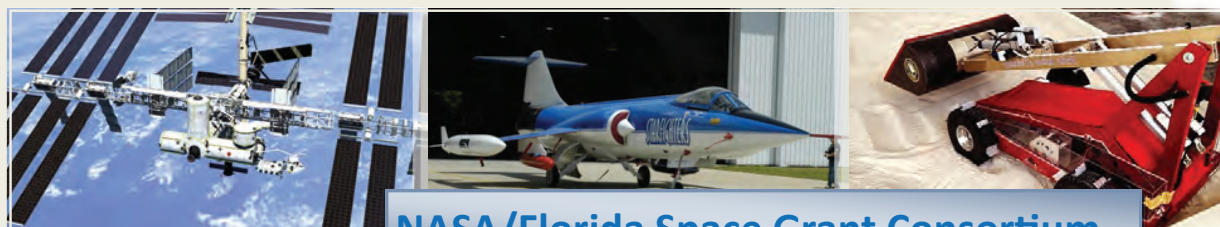
UNIVERSITY OF CENTRAL FLORIDA



Affiliates

Bethune-Cookman University
 Brevard Community College
 Eckerd College
 Embry Riddle Aeronautical University
 Florida A&M University
 Florida Atlantic University
 Florida Gulf Coast University
 Florida Institute of Technology
 Florida International University
 Florida State University
 Kennedy Space Center
 Orlando Science Center
 Space Florida
 Astronauts Memorial Foundation
 University of Florida
 University of Miami
 University of North Florida
 University of South Florida
 University of West Florida





NASA/Florida Space Grant Consortium

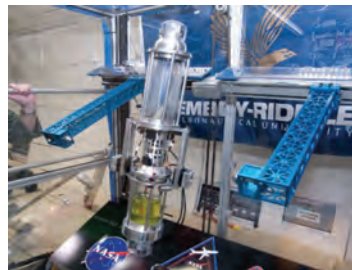
STUDENT RESEARCH

Refuel space systems in Low Earth Orbit (LEO) and Geo-Synchronous Orbit (GSO)

Nathan Silvernail, Masters student, Embry-Riddle Aeronautical University

BIOGRAPHY

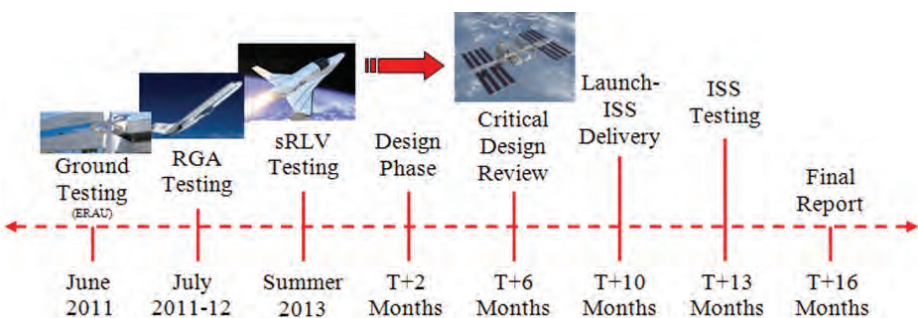
From a young age I had a unique fascination with the stars, not with their composition or how they moved, but with what might lay beyond them. I often found myself dreaming of the wonders they might hold and the answers we might find beneath the inexplicable depth of the universe. I decided that I would make it my life's work to help answer these questions and bring mankind closer to discovering the wonders of what we cannot yet perceive. I currently hold a Bachelor's of Science in Aerospace Engineering and a Master's of Science in Mechanical Engineering from Embry-Riddle Aeronautical University (ERAU). I have been the lead engineer on eleven reduced gravity flights onboard NASA's Reduced Gravity Aircraft (RGA) where I performed experiments pertaining to the development of on-orbit refueling of spacecraft and the study of fluid slosh dynamics on rotating bodies. I have designed the first working prototype of an advanced on-orbit refueling station that I fabricated using the CNC machines at ERAU and designed and built the prototype's flight computer in my lab at the university. In 2012, I was one of 12 people worldwide to be awarded the Emerging Space Leaders Grant where I traveled to Naples, Italy to present my work at the International Astronautical Congress. That same year, I started my own engineering company that focuses on related research and development projects for private and government organizations in the aerospace community.



During my time as a student, the Florida Space Grant Consortium was a very important influence on my career. Not only did they provide monetary support for my microgravity research projects, but I was awarded a Space Grant Fellowship that paid for the last year of my graduate schooling. Through the various Space Grant meetings I attended, I was able to meet professional engineers that opened doors for my research to advance to greater levels of testing.

RESEARCH

To achieve the goal of on-orbit refueling, the Technology Readiness Level (TRL) of the storage and transfer systems that will be required to perform such refueling operations must be advanced. The advancement of the TRL is accomplished through a systematic testing approach that takes the system, or components within the system, through stages of experimental testing that start in the laboratory and end on-orbit. From ground testing in the Fuel Slosh Laboratory at Embry-Riddle Aeronautical University (ERAU) in Daytona Beach, Florida to microgravity testing onboard NASA's Reduced Gravity Aircraft (RGA), Virgin Galactic's SpaceShipTwo and the International Space Station (ISS), a Centaur derived on-orbit refueling system was/will be tested to determine the physical stability of the system and operational viability of an innovative propellant transfer approach that utilizes rotational fluid settling to negate the need for propellant management devices, cryogenic pumps and an active Attitude Control System (ACS). Currently, I have successfully accomplished the first three phases of this research; including laboratory testing and 8 experimental flights onboard NASA's RGA with the sub-orbital testing phase scheduled to take place in the 4th quarter of 2013. During this campaign, I have



been working with researchers from Massachusetts Institute of Technology's (MIT) Space Systems Lab (SSL) to design and develop test equipment and procedures that would demonstrate the refueling system's characteristics in "real-time" scenarios onboard the ISS.



- AFFILIATES**
- Armstrong Atlantic State University*
 - Albany State University*
 - Clark Atlanta University*
 - Columbus State University
 - Fort Valley State University*
 - Georgia Institute of Technology - Lead Institution
 - Georgia Southern University
 - Georgia State University
 - Kennesaw State University
 - Mercer University
 - Morehouse College*
 - North Georgia College and State University
 - ORBIT Education, Inc.
 - Savannah State University
 - SpaceWorks Enterprises, Inc.
 - Spelman College*
 - University of West Georgia
 - University of Georgia
- PARTNERS**
- Agnes Scott College
 - Museum of Aviation

*HBCU or Minority Serving Institutions

Dr. Stephen Ruffin -
GSGC Director
Ms. Wanda Pierson -
GSGC Program Manager

Consortium Description

The Georgia Space Grant Consortium (GSGC) was established in 1989 to develop a statewide network of academic, industry, and non-profit partners dedicated to...

Maximize the number of Georgia students from all backgrounds who are well-prepared in science, technology, engineering, and mathematics (STEM) fields and who are motivated to support space and aeronautics programs vital to this nation.

The GSGC has 18 affiliate members and 2 partner organizations serving both metropolitan and rural

areas of the state. The GSGC team includes six Historically Black Colleges and Universities and two women-serving institutions.



Georgia ranks 8th in U.S. aerospace industry employment with nearly 200 aerospace companies with operations in Georgia. GSGC uniquely prepares students in STEM disciplines with its affiliates training and graduating thousands of students annually to meet this critical state need and the needs of NASA.



Summary of Programs

GSGC conducts research, internships, scholarships, fellowships, K-12 student and teacher training programs and public outreach. These program include:

- Higher Ed/Workforce Development
 - Fellowships, Scholarships
 - NASA and Industry Internships
 - Student & Faculty Research
 - Hands-On Programs (K-12 and College)
 - Faculty Research
- Teacher Training
 - Hands-On Workshops
 - College of Education teaming
- Public Outreach
 - Museum & Planetarium Programs
 - Camps and Science Programs
 - Media Interaction

Program Impact

Substantial impact achieved in training future engineers, scientists, and STEM educators. The GSGC:

- Annually supports diverse set of 115 undergraduate and graduate students per year in research projects, internships, scholarships and fellowships
 - Annually provides STEM education and hands-on activities at schools and science centers to 30,000 Georgia residents
 - Annually supports K-12 teacher professional development to over 4,400 educators
 - Has funded 100 Ph.D. recipients in STEM fields over GSGC history



GEORGIA SPACE GRANT CONSORTIUM

Student Highlight

Kalesha Bullard

PhD Student, Georgia Institute of Technology

B.S. and M.S. Graduate, University of Georgia

I am a Ph.D. student in Computer Science program at the Georgia Institute of Technology and am also pursuing a minor in Cognitive Psychology. My research concentration is Human Robot Interaction and Interactive Learning. I began graduate study at the University of Georgia (UGA) where I received my Master's Degree in Educational Psychology and Bachelor's degree in Mathematics Education. I have been able to utilize my unique combination of degrees in technology and education in two consecutive summer internships at the NASA Jet Propulsion Laboratory, and also in STEM outreach in underrepresented communities in metropolitan Houston and Atlanta.



Technical Accomplishments

During the summer of 2012, I received funding from the Georgia Space Grant Consortium to participate in a summer internship at the NASA Jet Propulsion Laboratory (JPL). My project was to build an ontology development and reasoning system. I returned to JPL again for the summer of 2013 and currently work in the Artificial Intelligence Group. My project this summer is more correlated with my long-term research interests, where here, the goal is to develop an interactive planning system for a team of mobile robots exploring a planetary surface, in collaboration with a human scientist. The system is designed to enable the robot with the cognitive capabilities to figure out if and when to query the human scientist for assistance, whenever uncertainty arises in achieving a goal. I also received Honorable Mention for the Ford Foundation Fellowship program in 2013, and was awarded a National Science Foundation (NSF) Graduate Research Fellowship from 2009-2012. As an NSF Fellow I worked on a team to design and simulate an intelligent autopilot for a miniature fixed-wing unmanned aerial vehicle (UAV). Our goal was to build a robust architecture, that integrated genetic algorithms and fuzzy logic methodologies, to autonomously navigate, control and stabilize the vehicle.



Outreach Accomplishments

I taught middle school mathematics for the 2006-2007 school year in the Atlanta Public School District as part of the Knowledge is Power Program (KIPP) national charter school system, where I volunteered to be the girls step team coach. I was also selected as a 2004 Teach for America (TFA) corps member and worked as high school mathematics teacher in the inner-city Houston Independent School District for two years (2004-2006), where I volunteered as an assistant coach of both the track team and girls step team. In 2005, I participated in an NSF-sponsored Research Experiences for Teachers summer program at the University of Houston, contributing to two research projects, both in communications & signal processing. Since returning to Georgia, I have served as

Chairperson of the Educational Development Committee in my sorority, planning activities and providing support for underrepresented youth in the community, and have volunteered to assist with the local high school girls step team. I continue to volunteer for other K-12 STEM mentoring and tutoring opportunities while pursuing my Ph.D.

Publications and Presentations

K. Bullard, "Using Semantic Mapping to Increase Mobile Robot Autonomy in Space Exploration." The University of Georgia Department of Computer Science External Advisory Board Meeting, 2012,

Poster, Qu, Y., S. Pandhiti, K.S. Bullard, W.D. Potter, and K.F. Fezer, "Development of a Genetic Fuzzy Controller for an Unmanned Aerial Vehicle" Modern Approaches in Applied Intelligence, Lecture Notes in Artificial Intelligence, 2011, Vol. 6703, pp. 328-335.



Hawai`i Space Grant Consortium

Consortium Description

The objective of Hawai`i Space Grant Consortium (HSGC) is to strengthen the Science, Technology, Engineering, and Mathematics education focus with the HiSTEM Pipeline. HSGC provides new opportunities for full-time undergraduate and graduate students to explore space related fields. Expanded opportunities for space education through the efforts of the HSGC have been focused on students and teachers of kindergarten through the twelfth grade.

The Hawai`i Space Grant Consortium is composed of ten institutions of higher learning spread over the 4 main Hawaiian islands and across the Pacific Ocean in Guam with two key industry partners. A significant goal of the program is to encourage interdisciplinary studies and research and to train future generations of space scientists and engineers. HSGC’s operational philosophy is to F.A.C.E. (Facilitate, Administer, Catalyze and Educate) the future.

Summary of HSGC Programs

Hawai`i Space Grant Consortium continues to build and maintain an educational pipeline that includes provisions for Science, Technology, Engineering, and Mathematics (STEM). HSGC has developed the HiSTEM Pipeline to propel the technical learning experiences from elementary school to Master’s level postgraduate degrees consisting of 3 branches in the areas of Space Science, Engineering, and Remote Sensing.



LEAD INSTITUTION

University of Hawai`i at Mānoa
 Hawai`i Space Grant Consortium
 HIGP/SOEST
 1680 East-West Road, POST 501
 Honolulu, HI 96822

ACADEMIC AFFILIATES

University of Hawai`i at Hilo
 University of Hawai`i Maui College
 Hawai`i Community College
 Honolulu Community College
 Kapi`olani Community College
 Kaua`i Community College
 Leeward Community College
 Windward Community College
 University of Guam

INDUSTRY PARTNERS

Hawaiian Electric Company
 Strategic Theories Unlimited, LLC

K-12 Programs

- Future Flight Hawai`i
- Space Explorers Science FESTival & BrushBot FESTival Nights
- NASA Explorers School
- Scholastic Robotics Programs
- Astronaut Discovery Days
- Teacher Professional Development Workshops

Undergraduate Programs

- Traineeship Program at the Community Colleges
- (NASA & Local) Internship Programs
- NASA Opportunities
- Geologic Remote Sensing Class
- Fellowship and Traineeship programs

Graduate Programs

- Master’s Apprenticeship Program
- Higher Education Courses
- Workforce Development Program





Hawai`i Space Grant Consortium



Student Highlight: Daniel Wukelic, University of Hawai`i at Mānoa



A Space (Grant) Odyssey

Space Grant Consortia are in a unique position to propel students into successful careers. As a sophomore in college with no work experience, no career goals and a dull outlook on my major in Mechanical Engineering, I was in need of some fuel. A friend encouraged me to gain some experience and join an extracurricular activity. On a whim, I went to a meeting for engineering majors interested in building a CubeSat. Although the project never took off (pun intended), it sparked an interest in me to keep exploring space. A volunteer summer internship with the Hawai`i Space Flight Laboratory (HSFL) exposed me to the work being done at the University of Hawai`i. I was performing small, remedial tasks but they were the building blocks for a career in the aerospace industry. HSFL has developed a unique environment to facilitate the development and testing of satellites in Hawai`i. Working at HSFL exposed me to the subsystems of satellites, component design and metal fabrication. The contacts that I made eventually lead me to my first Space Grant Fellowship in Spring 2012. My task was to develop a test bed for Attitude Determination and Control Subsystem (ADCS) testing, centered around an air bearing purchased by HSFL. As that fellowship wrapped up in May, I embarked on a journey to northern California for the summer. I had been selected to participate in the Summer 2012 Ames Aeronautics Academy at NASA Ames Research Center. The project, titled Subsonic Rotary Wing Analysis and Optimization, culminated in a trip to Washington D.C. to present our research at NASA Headquarters at the Ideas In Flight Seminar. In attendance were the Administrator of NASA, Charles Bolden, and Dr. Jaiwon Shin, the Associate Administrator of the Aeronautics Research Mission Directorate (ARMD). The presentation was met with good reviews and in April 2013 my team was awarded with the 2012 NASA ARMD Associate Administrator Award under the category of "High Potentials – Group". When school started back up in the fall, I was hired by HSFL to work part time designing, building and testing components for their most recent satellite. At the same time, I was part of a senior design team creating a cold gas propulsion system for small satellites. Testing of the prototype was performed on the ADCS test bed that I had contributed to building at HSFL. By the time Summer 2013 came around, I was working full-time at HSFL machining flight hardware for a satellite that will launch within the next year. I have applied for another Space Grant Fellowship opportunity for Fall 2013 and was accepted to work on my proposed research on cold gas propulsion system, integrating an IMU and feedback control for more precise maneuvering. I am extremely grateful for these amazing opportunities, all of which were made possible by the Hawai`i Space Grant Consortium and NASA.



An image created using 3D Modeling Software during my summer internship at NASA Ames. It shows the two models of tiltrotors that we created for civilian transport viewed from inside an airport.



Picture with the late Hawai`i Senator Daniel K. Inouye during my NASA Ames trip to Washington, D.C. "This was an incredibly special and rare opportunity."



An image of the cold gas propulsion system developed by my senior design team being tested on the ADCS Test Bed that I had built for HSFL.

NASA Idaho Space Grant Consortium

...IDAHOANS ENGAGED IN NASA'S MISSION OF EXPLORATION & DISCOVERY

Consortium Description

The vision of the Idaho Space Grant Consortium is for all Idahoans to be engaged in NASA's mission of exploration and discovery by participating in a portfolio of education, research, and public service opportunities in the fields of space and aerospace science and technology, and related STEM disciplines. To achieve this vision, the mission of the ISGC is to provide easily accessible, flexible programs that focus on current and ongoing NASA initiatives that will benefit researchers; K-university students, teachers, and faculty in STEM fields; industry; the general public; the State of Idaho; and ultimately, NASA.

Idaho's land grant institution, the University of Idaho, serves as the lead institution for the NASA ISGC. Twenty-one institutions comprise the membership of the ISGC, which includes nine higher education institutions in the state, five science centers and museums, two science organizations, a state park, a national monument, one state department, and an industry representative.

Summary of ISGC Programs

Higher Education & Workforce Development:

- Undergraduate Research & Scholarships
- Graduate & Faculty Research
- Graduate Fellowships
- Summer Internships within NASA & Industry
- Idaho Balloon Research Involving Student Engineers and Educators
- Robotic Lunar Exploration Program
- Microgravity University

K-Grey Education & Outreach:

- Idaho Teaching Engineering to Children
- Spaceward Bound
- Upward Bound (partner)
- STEM teacher training and hands-on activities for K-12 students
- ISGC guest speakers & colloquiums
- Idaho Science and Aerospace Space Scholars (partner)



Contact Information

Lead by Director, Dr. Joe Law

University of Idaho
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Moscow, Idaho 83844-1026

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Fax: 208.885.1399
Email: isgc@uidaho.edu
Web: <http://id.spacegrant.org>
[Facebook.com/NASAISGC](https://www.facebook.com/NASAISGC)
Twitter & Instagram:
[@NASAISGC](https://twitter.com/NASAISGC)



Affiliate Members

Boise State University • Brigham Young University-Idaho • Bruneau Dunes State Park • College of Idaho • College of Southern Idaho
Craters of the Moon Natural Monument & Preserve • Discovery Center of Idaho • Eastern Idaho Engineering Council • Idaho Academy of Science
Idaho Department of Education • Idaho Mobile Space Station • Idaho Museum of Natural History • Idaho National Laboratory
Idaho Science Teachers' Association • Idaho State University • Lewis-Clark State College • North Idaho College • Northwest Nazarene University
Palouse Discovery Science Center • University of Idaho • Warhawk Air Museum & NASA Space Place



ISGC Student Success Story Showcasing ISGC Student, George Korbel

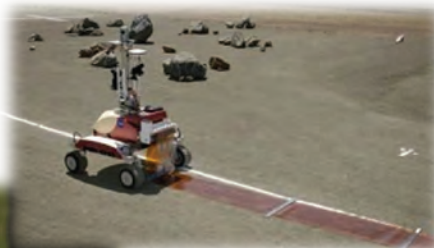
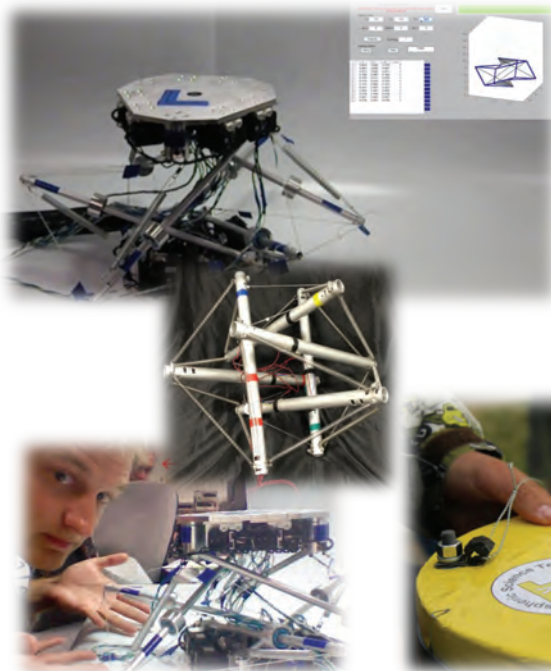
After graduating as Valedictorian of his small class in Orofino, ID. George Korbel made his way to the University of Idaho where he dove head first into one of the most demanding majors offered. As a freshman in mechanical engineering, George was assigned to the ISGC as a part-time work study employee, and quickly became a vital part of the ISGC team. He coordinated the Idaho TECH program, and assisted with numerous ISGC activities, immersing himself in the world of Space Grant. After being introduced to everything that the ISGC had to offer, he applied for an undergraduate scholarship and was awarded as a sophomore.

George enrolled in Near Space Engineering, a class offered as part of the ISGC's high altitude balloon program. He continued with the program for two years and took on responsibilities as a team lead.

As a senior, George had a unique opportunity to research "tensegrity" robotics as part of his senior design project offered through the NASA ISGC Robotics Lunar Exploration Program (RLEP). Working alongside his team and NASA Ames expert, Vytas Sunsprial, George's contributions to the project landed him an internship at NASA Ames Research Center in 2011. In addition, he was brought on as a mentor for the RLEP project as part of his ISGC fellowship.

Now, three years later, George finds himself once again in California, working alongside NASA experts. During his three years as an intern at NASA Ames, he has had the opportunity to work on a number of interesting projects, including; force sensing capabilities, controller coding, and interface for six degree of freedom tensegrity robots. He also prototyped a mechanism to deploy a rolled kapton film antenna from a K-10 planetary rover. This summer George's work as an intern focuses on building a new tensegrity structure for drop testing experiments. The goal of his work is to reduce landing accelerations of a science payload and validate drop-testing simulations.

George will return to the University of Idaho for his final year in the fall of 2013, before receiving his M.S. in mechanical engineering. The ISGC has been lucky to be a supportive part of George's journey, and is excited to see where his future may take him. He is a fantastic example of the effects that the National Space Grant Program



NASA/Illinois Space Grant Consortium



Consortium Description

Through its academic and science center affiliates, and its industrial partners, the Illinois Space Grant Consortium (ISGC) aims to promote science, technology, engineering and mathematics (STEM) in aerospace engineering and science within the State of Illinois. Emphasis is placed in involving a diverse population of talented students that reflects the diversity of the Illinois population and its academic institutions.

Summary of ISGC Programs

Programs include:

- ❖ Undergraduate scholarships
- ❖ Graduate fellowships
- ❖ Internship opportunities at NASA centers and aerospace industry
- ❖ Undergraduate research opportunities at academic affiliate institutions
- ❖ Academic course and program development
- ❖ Seed grants to promote interdisciplinary research
- ❖ Student hands-on projects, including CubeSat student satellite, high-powered rocketry, space robotics, RC aircraft, and high altitude ballooning programs
- ❖ STEM teacher training and professional development programs for Illinois K-12 teachers
- ❖ STEM programs for the general public at science centers and museum

Lead Institution
University of Illinois

Affiliates

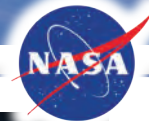
Adler Planetarium
Bradley University
The University of Chicago
Chicago State University
DePaul University
Discovery Center Museum
University of Illinois at Chicago
Illinois Institute of Technology
Northwestern University
Southern Illinois University Edwardsville
Western Illinois University

Industrial/National Laboratory Partners

Argonne National Laboratory
CU Aerospace
Fermi National Accelerator Laboratory
IllinoisRocstar
Ingenium Aerospace

www.ae.illinois.edu/ISGC





NASA/Illinois Space Grant Consortium



Erik A. Lopez, University of Illinois

Erik Lopez can identify the event that sparked his passion for aerospace. A fourth-grade field trip by his Los Angeles school to the Joint Propulsion Lab (JPL) set his goal to become an astronaut. Erik hasn't looked back; he has devoted his time in school, work and service to making that goal come true. Three internships, two at UCLA labs and one with a private biotech company, provided Erik with valuable hands-on experience in science and engineering research. The summer following his graduation from high school, he returned to JPL, this time as an intern on a project to engineer and develop a differential scanning calorimeter for cryogenic radiation test facility.

In Fall 2011, Erik entered the aerospace engineering program at the University of Illinois' Urbana campus as a very enthusiastic freshman. Since his arrival, his enthusiasm has not waned. Erik immediately joined the Illinois Space Society, a chapter of the national Students for the Exploration and Development of Space (SEDS). His focus on local outreach led to his serving as the National Director of Educational Outreach for SEDS.

Erik's work with NASA researchers and engineers has continued. He was a member of the NASA Marshall Propulsion Academy team that interfaced an H-1 actuator from a Saturn I and IB rocket with an inertial load simulator for thrust vector control testing. Erik was one of a five-student team selected by NASA researcher Sherri Thaxton to conduct experiments through NASA's Reduced Gravity Education Flight program. The team was to demonstrate and record human response to using an iPad tablet computer in microgravity. Erik is currently a co-op student at NASA Johnson. His co-op projects have included developing and analyzing instrumentation plan for sub scale and partial regenerative cooling experiment for Morpheus, a liquid oxygen, liquid methane rocket and as flight lead at NASA's Neutral Buoyancy Lab.

Erik has won numerous awards. The Illinois Space Grant Consortium has supported Erik at the Propulsion Academy and the Reduced Gravity team, and awarded him with two ISGC scholarships. He is the recipient of a four-year Gates Millennium Scholarship and winner of the inaugural National Space Club Keynote Scholarship.



Erik giving presentation at National Space Club dinner.



Erik on reduced gravity flight.

Quote from Erik Lopez

I can no longer contain my excitement and passion for space, I must spread it with everyone I meet! Space has a power to inspire that cannot be compared; I have been doing my best to utilize Space as a tool to change the lives of young students. Even the biggest dreams have the smallest beginning, whether it's a small rocket launch or a short space related demonstration, anything when performed with passion and excitement can have a lasting impact.



Mission Statement

The mission of the INSGC is to promote workforce development, formal and informal education, and research in STEM areas by the dissemination of NASA-related activities, content, and opportunities to the residents of the State of Indiana.

Vision Statement

The INSGC will be the premier source of coordination, information, and inspiration for the NASA-related education, outreach, and workforce needs of the State of Indiana.

Goals

- INSGC will promote NASA-related STEM workforce development by providing support to STEM research and education in higher education setting.
- INSGC will provide educational opportunities for K-12 students and teachers in order to inspire students to STEM disciplines.
- INSGC will collaborate with formal and informal STEM educators in order to promote awareness of NASA-related missions to the general public.

Contact Information

Purdue University Discovery Park
 Mann Hall, Room 160
 203 S. Martin Jischke Dr. 47907
 (765)-494-5873
<https://engineering.purdue.edu/INSGC>



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Academic Affiliates

- Anderson University
- Ball State University
- Indiana State University
- Indiana University
- Indiana University-Purdue University Fort Wayne
- Indiana University-Purdue University Indianapolis
 - Purdue University
 - Purdue University Calumet
- Purdue University College of Technology at Columbus/ Greensburg
- Saint Joseph's College
 - Taylor University
 - Trine University
- University of Evansville
- University of Southern Indiana
 - Valparaiso University

Outreach Affiliates

- Challenger Learning Center of Northwest Indiana
 - Children's Museum of Indianapolis
 - Ethos, INC.
- Evansville Museum of Arts, History, and Science
 - IMAX Theater
- Challenger Learning Center of Indianapolis
 - Science Central
 - Indiana State Museum
 - Terre Haute Children's Museum

Corporate Affiliates

- Stratostar Systems



INSGC Past Awardee Accomplishments

All of our awardees have gone out into the world and done amazing things. These are just a few that we picked to highlight.

Justin Goeglein was funded in 2009 and went on to work as a Hybrid Controls Engineer at an electric car company.

Keena Byrd received funding from 2005-2007 from INSGC. She is now working as a Human Factors Engineer at Intel Corp in Chandler, AZ.

In 2008, 2009, and 2011, INSGC funded Michael Zwach, who is now a contractor at NASA Ames with DSI developing space technologies, and is the chair of SEDs.

From 2008-2011, INSGC funded Jennika Laird, who is now a Software Engineer at Diebold, Inc in North Canton, OH.

In 2010 INSGC funded Adam Harden, who went on to work at Boeing Satellite Development Center in El Segundo, CA.

For the upcoming year, INSGC is funding Katelyn Grove, who is doing research on how modern technology has influenced NOAA's Weather Radio.

David Rozovski was funded in 2009, and joined the Navy in STEM related field related to the research he conducted with INSGC's funding.

Chris Davies was funded in 2011 and has been doing research on mechanisms involved in diseases to help identify targets for drug discovery. He will be attending UC Berkeley for his Post-Doctorate.

In 2011, INSGC funded Helena Olatunji-Fleming who then enrolled in a PhD program and presented her research at the Society of Women Engineers International Conference.

For 2012 and 2013 INSGC funded Angela Van Sistine, she has been researching star formation in our local galaxy, using a recombination line of hydrogen.

Timothy Harris was funded by INSGC in 2011. He is grateful to INSGC and NASA for funding him and allowing him the opportunity to intern at NASA's Langley Research Center.

Jackie Jaron was funded in 2006 by INSGC and has since moved on to work at Millennium Space Systems as a Mission Design and Systems Engineer.

Each of these students and many others have told us how much they appreciated this funding and how it has helped them accomplish their dreams.



Become a fan at
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NASA/Iowa Space Grant Consortium

Consortium Description

The Iowa Space Grant Consortium (ISGC) aims to improve Iowa's future in aerospace science and technology and to stimulate aerospace research, education and outreach activities throughout the state. These goals are accomplished through a network of its academic members—Drake University, Iowa State University, the University of Iowa and the University of Northern Iowa—and its affiliate members representing business, government and education. Working together, these entities from the public and private sectors are ensuring that Iowa and its citizens will play an important role in aerospace science and technology today and in the future.

Summary of ISGC Programs

The ISGC carries out its goals through five broad program areas: higher education, research infrastructure, fellowships and scholarships, precollege and informal education. Some general initiatives are given below.

- Grants for base programs at each academic member to strengthen an emerging area of research
- Seed grants to promote interdisciplinary research
- Cooperative programs among universities, industry and government
- Undergraduate and graduate fellowships and scholarships
- Summer internships at NASA centers
- Student opportunities for hands-on STEM experiences
- Professional development for STEM K-12 educators
- STEM programs for K-12 students
- STEM programs for the general public at science centers and museums

Lead Institution:

University of Northern Iowa

Academic Members

Drake University
Iowa State University
University of Iowa

Affiliates:

Aerial Services, Inc.
AeroDyne Laboratories
Ames Lab, U.S. Dept. of Energy
Cedar Rapids Science Center
Grout Museum District
Iowa Academy of Science
Iowa Aviation Promotion Group Inc.
Iowa DNR/Geological Survey
Iowa Dept. of Education
Iowa DOT/Office of Aviation
Iowa Space Science Center
National Lab for Agriculture & the Environment
National Mississippi River Museum & Aquarium
Putnam Museum
Rockwell Collins, Inc.
Science Center of Iowa
Softronics Ltd.



NASA/Iowa Space Grant Consortium

Student Research

Ear Manipulations Reveal Importance of Gravity Input for Orientation Development

Karen Thompson, University of Iowa

Karen Thompson is a doctoral student in biology at the University of Iowa. She received her B.A. in biology and psychology from Luther College in Decorah, Iowa, which awarded her a Presidential Scholarship. She has worked on various research projects, ranging from determining the effects of voluntary exercise on pulmonary vasculature and studying the neuroendocrine system of insects to studying the developing nervous system. She is now part of a team of biochemists, engineers and biologists led by Dr. Bernd Fritsch, who heads the base program at the University of Iowa.



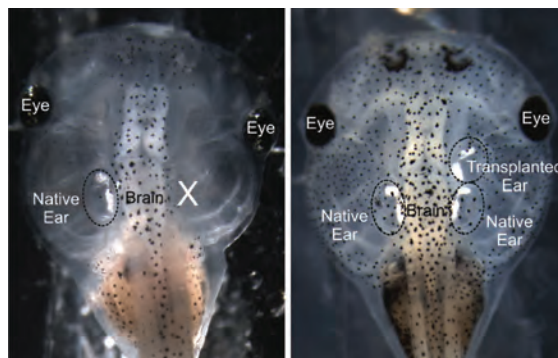
This research project seeks to understand how gravity influences sensory development, information essential for countermeasures in future space flights. Because gravity is present at the same strength everywhere on Earth, this can be done in only two ways: exposing developing embryos to microgravity in orbit or manipulating ear development, the inner ear being the main gravity sensor.

After excising ears from one side in frog embryos, we transplanted these ears next to the native ear to generate three-eared frogs with two tandem ears on one side. The ears were transplanted in either their native orientation or rotated 90 degrees. These manipulations allowed us to study if the mismatched and asymmetric inputs can be compensated behaviorally and how this is accomplished at the neuronal level.

High-speed and high-resolution cameras revealed the effects of altered gravity sensation in the swimming tadpoles. Normal and three-eared frogs with native orientations showed oriented swimming, whereas one-eared and three-eared frogs with rotated ears were disoriented. Fluorescent dyes indicated that when the transplanted ear was aligned with the native ear, fibers from both ears overlapped in the hindbrain, but when the transplanted ear was rotated by

90 degrees, fibers from both ears mostly segregated from each other. Furthermore, in animals in which the ear was removed, Mauthner cells, hindbrain target neurons of inner ear fibers, had a greatly reduced branching of processes, unlike in animals with an additional ear, where there was increased branching.

The results indicate that gravity helps fine-tune connections of the inner ear with the hindbrain and shapes hindbrain target neurons that use gravistatic inputs to guide swimming behavior of the animal. In summary, our system can test how balanced gravity input shapes orientation behavior and its underlying connections. In shorter microgravity space flights, our system of three-eared frogs should result in an asymmetric input regardless of the orientation of the third ear and in disoriented swimming and concomitant changes in connections upon return to normal gravity.



Frog tadpoles in which the gravity-sensing ears have been manipulated. On the left is a tadpole in which the right ear has been removed (X). On the right is a tadpole that has received an additional ear on one side (Transplanted Ear). The left side of both tadpoles serves as a control.



Consortium Description

The Kansas Space Grant Consortium, formed in 1991, is a member of the National Space Grant College and Fellowship Program, a network of 52 Space Grant Consortia funded by the National Aeronautics and Space Administration (NASA). The Kansas Space Grant Consortium is a partnership among NASA, the consortium members, and Kansas industry. The Consortium is involved in numerous national, statewide, and individual member activities.

KSGC Vision Statement

In the 21st Century, Kansas will be known worldwide as a leader in aviation and space education, research and industry.

KSGC Mission Statement

The Kansas Space Grant Consortium will be a catalyst for Kansas to be a leader in aviation and space education, research and industry.

Summary of KSGC Programs

KSGC programs enrich student education and knowledge through supporting and encouraging STEM based learning and career fields. KSGC programs:

- Undergraduate and graduate research scholarships and fellowships.
- Summer internships at NASA centers.
- Team competitions: Design Build Fly (DBF), rocket club, etc.
- Teacher In-service workshops (K-12 and College)
- Student STEM Camps (K-12)

Lead Institution:

Wichita State University

Academic Affiliates:

Emporia State University

Fort Hays State University

**Haskell Indian Nations
University**

Kansas State University

Pittsburg State University

University of Kansas

Museum Affiliate:

**Kansas Cosmosphere and
Space Center**

Follow KSGC on:





Emily Arnold

NASA/Kansas Space Grant Consortium

Development and Improvement of Airborne Remote Sensing Radar Platforms The University of Kansas

Over the last eight years I have received significant support from the Kansas Space Grant Consortium (KSGC) as I pursued both Bachelor's and Doctorate degrees in aerospace engineering at the University of Kansas. As an undergraduate research assistant, funding from the KSGC enabled me to work in my advisor's composite materials lab where I assisted in fabricating a 1,100-pound Unmanned Aerial Vehicle (UAV). This UAV, called Meridian, was designed and developed by university faculty and graduate students for the purpose of cryospheric surveying, and as an undergraduate researcher I was responsible for fabrication and integration of flight worthy airframe parts. It was this experience with the Meridian project that piqued my interest to stay on as a graduate student at KU. In addition to the Meridian project, KSGC also funded me and three other undergraduate students to participate in NASA's Microgravity University.



Participation as an undergraduate in design-build-fly projects and NASA flight activities, like the Meridian research experience and Microgravity University, uniquely prepared me to take on significant roles in the design and development of new airborne remote sensing platforms used for cryospheric surveying as part of NASA's Operation Ice Bridge (OIB). OIB is NASA's initiative to extensively survey Earth's polar ice using airborne platforms. In the first two years of my PhD program, in which I was partially funded by a KSGC bridge fellowship, I served as the lead designer of custom support structures and fairings that enabled both the NASA DC-8 and P-3 aircraft to be equipped with suites of sensors used to measure polar ice thickness, internal layers, and snow accumulation. The integration of these sensors required a delicate balance between electromagnetic, structural and aircraft performance requirements set forth in each discipline. The NASA DC-8 and our integrated sensor suite represent the first ice penetrating radar array capable of sounding deep bed conditions from a long-range, high altitude, and transonic speed aircraft, and the NASA P-3 with integrated sensors is the world's largest ice and snow radar suite. While the P-3 has been exclusively flown in Greenland, the DC-8 has performed surveying missions over both Greenland and Antarctica. Over the last four years, these aircraft have flown almost 200 science missions and have collected over 240 TB of unique science data for glaciologists.

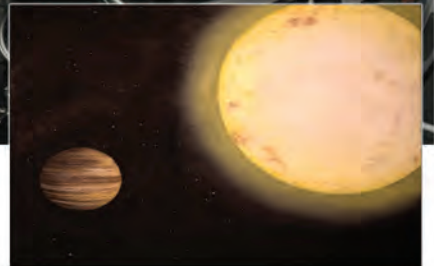
During the final two years of my PhD studies, part of which have been supported by the NASA Earth and Space Science Fellowship, my work has focused on improving both our current and future airborne remote sensing systems. I have done this in part through geometric modification of the fairings as well as the airframes. However a larger focus of my work has been mitigating aircraft integration effects on the antenna-arrays to improve beam forming. Some of these integration effects include control surface deployment and wing flexure. I have developed a method that compensates for out-of-plane antenna displacement due to wing flexure, and have shown this to improve array clutter suppression by as much as 10 dB. Surface clutter is a primary topological feature that prevents ice-sounding radars from detecting the ice-bed interface, and this improved suppression will enable the radars to detect the bed echo in areas with rough ice surfaces.

These new systems, in combination with my work on mitigating aircraft integration effects, have and will improve polar ice measurements, which results in improved ice sheet models. Changes in polar ice sheets mass balance is directly related to global sea-level rise. As such, this is a problem of global significance and my work has helped NASA in becoming a leader in providing scientists with the best ice sheet data.





KELT-6b Exoplanet Discovery Team
Illustration: Erin Plew/Queen of Arts LLC



Consortium Description

The NASA Kentucky Space Grant Consortium positively impacts faculty and students across the Commonwealth who contribute to solving NASA's challenges and develop Kentucky's STEM aerospace workforce and economy. Under the inspiring initial leadership of Drs. Richard and Karen Hackney, the Consortium grew and invested in Space Science and Human Spaceflight important to a variety of Kentucky academic affiliates and invested in multi-disciplinary, multi-institutional Space Technology workforce development that launched Kentucky's first satellites and became Kentucky Space LLC. Current programs expand industrial partnerships and develop Kentucky's Aeronautics workforce pipeline, early-career faculty, STEM students, and STEM pre-service and in-service teachers.

Summary of NASA Kentucky Programs

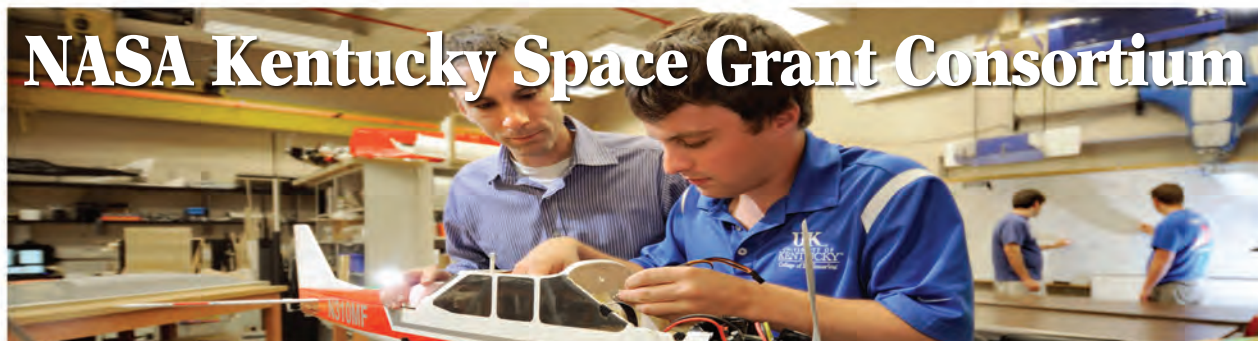
NASA Kentucky Space Grant offers a portfolio of programs that provide Pathways of Opportunities for students to pursue the aerospace career of their dreams. Faculty in Kentucky mentor students, develop expertise, and build NASA / Industry relationships guided by objectives that interweave NASA Kentucky Space Grant and EPSCoR Programs.

Program highlights include:

- Graduate Fellowships
- Undergraduate Scholarships
- NASA and Industry Internships
- Undergraduate Team Projects
- Course/Curriculum Development
- Faculty Research Initiation Awards
- Mini-Grants for STEM Recruitment, Retention and Teacher Training

- Lead Institution**
University of Kentucky
- Affiliate Members**
Bellarmine University
Centre College
Eastern Kentucky University
Innoviator LLC
Kentucky Institute for Aerospace Education
Kentucky Science and Technology Corporation
Kentucky Space LLC
Kentucky State University
Morehead State University
Murray State University
Northern Kentucky University
Theta Tech Solutions LLC
Thomas More College
Tribo Flow Separations LLC
University of Louisville
Western Kentucky University





Dr. Sean Bailey and Scott Ashcraft conduct research in the UK UAV Lab

Student Pathway of Opportunities

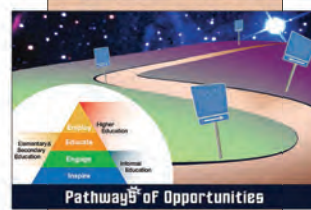
Scott Ashcraft University of Kentucky / BS Mechanical Engineering

NASA Kentucky Space Grant offers a portfolio of programs that enable students to pursue a Pathway of Opportunities to build their aerospace career. Scott W. Ashcraft, a talented student leader who graduated in May 2013 with a BS Mechanical Engineering from the University of Kentucky (UK), is an excellent example of students in Kentucky who are making the most of these opportunities.

Scott grew up in Georgetown, Kentucky inspired by his dream of becoming a pilot and learning all he could about flight through remote-control aircraft. His technical and leadership talents were soon recognized at Scott County High School where he was Valedictorian, completed his Eagle Scout, and was awarded a UK Presidential Scholarship. At UK, Scott became engaged with NASA and NASA Kentucky Space Grant as a Summer 2010 intern at Langley Research Center, performing data analysis of flow visualization imagery of the Mars Science Lab (MSL) Reaction Control System jets. In 2011, Scott advanced his aeronautics education when he was selected to be one of the first cohort of students in the new NASA Aeronautics Academy hosted at Glenn Research Center.

The culmination of Scott's undergraduate experience with NASA Kentucky programs was three-faceted: 1) Scott led an undergraduate team that designed, built, and tested an unmanned research aircraft, BLUECAT, for measurement of atmospheric turbulence, 2) Scott worked as an undergraduate research assistant developing flight test platforms for wing-shaping control of deployable unmanned aerial vehicles (UAVs), and 3) Scott led a college student team who managed and conducted the high school Wing Design Competition for 15 school districts and hundreds of pre-college students of the Kentucky Institute for Aerospace Education.

Scott is about to complete his pilot's license and is a Senior Member of Civil Air Patrol. He is a NASA Student Ambassador and a UK College of Engineering Ambassador. He also led the student chapter of the American Institute for Aeronautics and Astronautics (AIAA) as President and Vice-president. Scott's research is presented in four technical papers at major AIAA conferences, as well as a NASA Technical Memorandum. He will pursue a Masters in Aerospace Engineering at Georgia Tech starting in Fall 2013.



NASA / LOUISIANA SPACE GRANT CONSORTIUM

LaSPACE is a Federal-State partnership funded by NASA & the Louisiana Board of Regents



The Louisiana Space Grant (LaSPACE) mission is to enhance Space and Aerospace related research, education, and public awareness throughout the State of Louisiana and thereby promote STEM education, training of professionals, and economic development.

LASPACE CONSORTIUM

LaSPACE is the Louisiana organization in the National Space Grant and Fellowship Program network, which was designed to network colleges, universities and state education boards with partners in business, industry and the non-profit sector in order to promote, develop, and strengthen aerospace science, research, technology, education, and awareness.

LaSPACE promotes scientific research, workforce development, and public outreach to develop and strengthen long-term research capabilities within Louisiana that will make significant contributions to the research and technology Mission Directorates of NASA.

LASPACE STRATEGIC GOALS

- 1) Foster aerospace related, interdisciplinary, science, technology and engineering research and education at Louisiana colleges and universities.
- 2) Encourage aerospace related industries in Louisiana for economic development and diversification.
- 3) Promote and contribute to science, technology, engineering and mathematics pre-college education excellence.
- 4) Engage and educate the general public in NASA's space exploration projects, benefits and opportunities as well as Louisiana's role in the NASA program.
- 5) Maintain a cooperative, effective and inclusive consortium of Louisiana institutions to promote aerospace related research, education and economic development.

LASPACE PROGRAMS

To meet the objectives of the federal program and achieve our strategic goals, we have developed a variety of funding opportunities to serve students, teachers, and researchers across our state, which include:

- Graduate Student Research Assistance (GSRA) Awards
- Fellowships for PhD students
- LaSPACE Undergraduate Research Assistants (LURA)
- Minority Research Scholars (MRS) Program
- Higher Education Senior Design Capstone Support
- Louisiana Aerospace Catalyst Experiences for Students
- High Altitude Student Platform Program
- K-12 Teacher Education Training and Development Support
- Seed funding for New Research Development

LaSPACE programming served nearly 150 undergraduate and graduate students during FY12 alone. We funded 64 students with fellowships and scholarships, and the remaining 80+ students were involved with our higher education programs or research infrastructure grants.

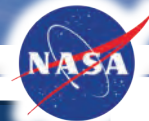
<http://LaSpace.LSU.edu>

Lead Institution

Louisiana State University

Affiliates

- Dillard University
- Cain Center for STEM Literacy
- Grambling State University
- Highland Road Park Observatory
- Jacobs Technology at Michoud
- La Art & Science Museum
- La Board of Elementary & Secondary Ed
- La Board of Regents
- La Business & Technology Center
- Louisiana Tech University
- LSU Agriculture Center
- Loyola University
- Louisiana State University, Shreveport
- McNeese State University
- Nicholls State University
- Northwestern State University of La
- Sci-Port: La's Science Center
- Southeastern Louisiana University
- Southern University, Baton Rouge
- Southern University in New Orleans
- Tulane University
- University of Louisiana at Lafayette
- University of Louisiana at Monroe
- University of New Orleans
- Xavier University of Louisiana



NASA / LOUISIANA SPACE GRANT CONSORTIUM

LaSPACE is a Federal-State partnership funded by NASA & the Louisiana Board of Regents



STUDENT SPOTLIGHT: CARLA GUZZARDO, PHD

"I am a first-generation graduate student. My parents only finished high school and my siblings stopped at bachelor degrees. Having the fellowship available allowed me to devote all my time and energy to my studies and it was needed."



Guzzardo & Faculty Mentor, Dr. Pang, December 2012.

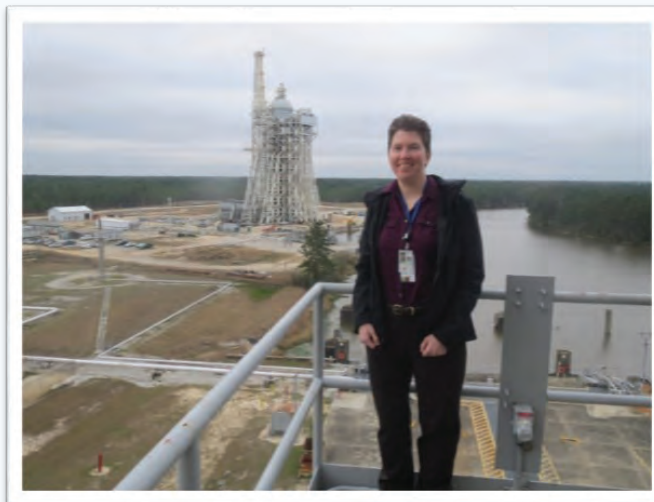
Carla Guzzardo had planned to pursue a master's degree, which she began as a non-matriculating student in 2004 because she couldn't afford to return to school full-time. The LaSPACE fellowship Carla was awarded in 2006 allowed her to fulfill her ultimate goal, completing a PhD program.

Carla is now a mechanical engineer with Lockheed Martin IS&GS, working on the Test Operations Contract at Stennis Space Center. Her job is to support testing of RS-25 (formerly known

as Space Shuttle Main Engine), which will be used to power the first stage of NASA's Space Launch System. Her responsibilities include design and analysis of the piping that supplies fuel to the engine, as well as structures that hold the engine in place.

Carla hopes to return to Louisiana to further strengthen the aerospace infrastructure in her home state. Beyond the much needed financial support, Carla believes that the LaSPACE program is evidence of an intellectual commitment to the industry in Louisiana. Carla says,

"The only reason I went out of state for my undergraduate degree was because of the lack of quality aerospace education within Louisiana at that time. Even though I am working in Mississippi, I fully intend to one day either open a business in Louisiana that supports aerospace innovation or return to teach aerospace and engineering and be a PI on aerospace research at LSU...or both!"



Guzzardo on a test stand at Stennis, February 2013.



Consortium Description

The mission of the Maine Space Grant Consortium (MSGC), an Affiliate-based 501(c)(3) corporation, is to improve our Affiliates research infrastructure in areas of mutual interest to NASA and the state of Maine; to encourage more students to consider careers in fields of science, technology, engineering, and mathematics (STEM); and to enhance NASA’s presence throughout the State of Maine.

Summary of MSGC Programs

Through our Affiliates we achieve our mission by competitively funding projects in four national objectives: Research Infrastructure, Higher Education, Pre-College and Informal Science:

- Scholarships and fellowships for undergraduate and graduate students.
- Faculty research and curriculum enhancement grants
- Collaborative partnerships with Minority-Serving Institution of Higher Education.
- Undergraduate high altitude ballooning program.
- Undergraduate summer internships at NASA centers.
- Provide support for in-service STEM-focused professional development.
- Summer internships for high school students at MSGC Affiliates and Maine industry.
- Teacher training and professional development

Lead Institution

Maine Space Grant Consortium

Affiliate Members

Applied Thermal Sciences
 Bates College
 Bigelow Laboratory for Ocean Sciences
 BioAnalyte, Inc.
 Bowdoin College
 Challenger Learning Center of Maine
 Colby College
 College of the Atlantic
 Gulf of Maine Research Institute
 Island Astronomy Institute
 Lockheed Martin
 Maine Manufacturing Extension Partnership
 Maine Maritime Academy
 Maine Mathematics and Science Alliance
 Saint Joseph’s College
 Southern Maine Community College
 University of Maine
 University of New England
 University of Southern Maine

General Members

Blueberry Pond Observatory
 Island Institute
 Maine Department of Education
 Northern Maine Museum of Science
 Technology Systems, Inc.





Student Research

Luke Saindon, B.S. in Mechanical Engineering, University of Maine, 2012

Biography: I was born and raised on Deer Isle off the coast of Maine where I was home-schooled until I attended Deer Isle Stonington High School where I started building small rocket engines, a fascination that started in the shop helping my father and still continues. In the summer of my junior year in 2010 at the University of Maine, I worked on a ramjet propulsion project at Applied Thermal Sciences in Sanford, Maine as an Exploration System Mission Directorate intern through MSGC. In the summer of my senior in 2011, I was awarded a NASA Propulsion Academy summer internship through MSGC's Maine Aerospace Workforce Development Program to work at Marshall Space Flight Center. For my senior undergraduate project, as one of six members of "Team Ursa", we built a two-stage sounding rocket capable of 180,000 ft. while carrying a scientific payload of 5 lbm; collecting HD video; and taking airframe pressure measurements to confirm computational fluid models. The vehicle itself is two solid propellant stages, 18.5 ft. in total length, weighing 325 lbs. fully loaded and 214 lbs. without propellant. For my honors thesis I worked on developing an oxidizer flow control system for a hybrid rocket engine, which I believe would improve this vehicle's mission flexibility. If the booster motor performs as hoped then it will supply 140,000 Ns of total impulse with an average thrust of 3700 lbs. The sounding rocket and honors thesis were all made possible in part with funding from MSGC. The rocket is currently waiting for a launch window. I took four months off after graduation to tour France to improve my French, and now I am working on graduate school applications.

Research: At MSFC, I was involved in two projects. The first project was the development of a gauging system to find the mass of fluid in a tank when in a 0 g environment. This has proven to be a very tricky problem in the past, and current solutions lack simplicity and lightness. Our team's solution was to use a modified Michelson Interferometer to measure ullage density change when a small piston was used to cycle the overall system volume. In the modified Michelson interferometer, a laser beam is split into two separate beams. One beam travels through a control of air and the other through a sample of the ullage. The beams recombine and display an interference pattern with constructive and destructive regions, known as fringes. As the piston expands or compresses, the properties of the ullage change, thus producing continuously changing fringe patterns. A photodiode detects the fringe shift by plotting intensity of light over time. The number of fringes is mathematically related to the density change in the ullage gas. We had success with a proof of concept and were able to get enough data to show promise with the design. The second project was the measurement of the liquid level in a tank via a small surface float. The liquid surface was highly chaotic which eliminated the possibility of measurement directly via laser or ultrasonic means. I designed and built a float with enough passive fluid damping such that it read the average fluid level and eliminated the noise of the water's surface. A laser was then used to measure the float's position. The application was the fluid level monitoring in a POGO suppression device. The design of this device involved the simulation of my damping system and then the building of a test rig. My simulation ran in MATLAB and simulated the actual system response very well, allowing the use of the MATLAB tool for the design of other float indicators.

My current pursuit in aerospace is "Team Ursa" which is continuing to carry me into my future work including inspiring younger people to become engineers. "Team Ursa" is currently developing student payload launch services that would be easily available and affordable for small schools. Though we've mastered basic chemical propulsion, its widespread use is absent in the educational world; there should be a way to ping off hundreds of flights per year that are easy for small non-specialized high schools to access. Working with a small non-profit in Silicon Valley, the team has developed new modularized launch vehicles that will allow easy, smart-phone based student payloads to access near space, sub-orbital space, or even orbital applications. Test flights begin in the fall 2013. These new types of spacecraft can be snapped together on top of any type of propulsion, including balloons, and will allow schools to build phone-based spacecraft using open sourced reference designs for hundreds of dollars instead of many thousands. The universal parts and standards will make the necessary school based expertise minimal. Mastering a unified, standardized way to inspire student engineers has become the new mission of Team Ursa and is the direct result of the previous aerospace opportunities provided by MSGC and NASA that each of the team members has had.



"Delta-P", Team Ursa's sounding rocket.



<http://www.mdspacegrant.org>
NASA/Maryland

Space Grant Consortium Affiliates:

- Towson University
 - Hagerstown Community College
 - University of Maryland Eastern Shore
 - The University of Maryland at College Park
 - The United States Naval Academy
 - National Center for Earth and Space Science Education (NCSSE)
 - University of Maryland Baltimore County
 - Capitol College
- The Johns Hopkins University (lead institution)
 - The Johns Hopkins University Applied Physics Laboratory
 - Morgan State University
 - The Space Telescope Science Institute
- Working closely with NASA's Goddard Space Flight Center in Greenbelt, Maryland*
- Preparing Maryland students for the NASA workforce of the future...



← Intrigue our kids—and guide them to STEM (Science, Technology, Engineering, and Mathematics) career choices, with longitudinal tracking of their progress.

A sampler of past and ongoing Maryland Space Grant Programs:

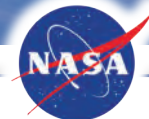
- Saturday Academy at Morgan State University
- “Women in Engineering” at the University of Maryland College Park
- Exploration System Mission Directorate: \$40,000 student project support
- Balloon Payload Program at UMCP & MSU & Hagerstown CC
- Landsat Imagery at Towson University
- Earth/Space Science Teacher Training program at the JHU
- Explorations in Space & Astronomy: CTY at the Applied Physics Laboratory
- Student experiments on Space Station: NCSSE
- Up, Up, and Away student program, JHU Applied Physics Laboratory
- RockOn, RockSat C & Rocksat X, US Naval Academy & UMCP & JHU
- Girls Exploring Engineering, Hagerstown CC
- Precision Agriculture through Remote Sensing, UMES
- Robot Sampling Platform for Water Quality Studies, UMES



← “Hands on” student balloon launches from Western Maryland
 ... to the edge of space: >100,000 feet!



← A Space Grant Graduate Student Fellowship allows student training and public viewing of the heavens from the Maryland Space Grant Consortium Observatory creating public understanding of why NASA wants to explore the Universe, and helping guide undergraduates toward STEM careers and the NASA workforce of the future.



Spotlight on Heather Bradshaw



Participation in Space Grant-funded opportunities has had a great impact for me. My first interaction with Space Grant was in the form of the NASA Academy internship (MDSGC generously provided the funding). This opened up worlds of opportunity for me, as I had a chance to interact with some of the top minds and most accomplished professionals in the aerospace field, from a variety of NASA Centers and in industry. These network contacts proved very valuable later in my educational and career endeavors. It also provided me the first taste of working at NASA Goddard, which I quickly fell in love with, and which inspired me to

pursue (and thankfully receive) both a co-op position and now full-time employment at Goddard. As an intern and later as a co-op at Goddard, I had the opportunity to work on several exciting flight projects, including: James Webb Space Telescope, Solar Dynamics Observatory, Magnetospheric MultiScale Mission, and Lunar Atmosphere and Dust Environment Explorer.

Maryland Space Grant funded me to travel to the Mars Desert Research Station, where I had the challenging and rewarding experience of participating in a simulated Mars mission. This also provided me with an excellent opportunity for research while there, I had the chance to do field testing with a prototype astronaut hand tool that I and colleagues had developed and built in the lab at school. We presented the research findings of our field testing at the regional student conference, and were awarded first place, as well as invited to present at the international level conference. I requested, and (and thankfully received) funding from MDSGC to attend this conference, and to present my research there.

These incredible experiences enabled by Maryland Space Grant had other ripple effects. For example, the work experience at NASA gave me a competitive edge when applying for prestigious scholarships, including the Goldwater Scholarship, and the NSF GRFP fellowship, both of which I was very fortunate to receive, and the funding was of great assistance in enabling me to finish my undergraduate and graduate engineering degrees, respectively. Thank you, Space Grant! (Heather Bradshaw)

Currently, as a full-time thermal engineer, I am working on the MOMA instrument for ExoMars, as well as the ATLAS instrument for ICESat-2. In the scope of my work in thermal engineering, I have had the opportunity to contribute to many different phases: from proposal-level design efforts, to thermal modeling analysis and design, to integration and testing of the spacecraft. In addition to my work as a thermal engineer, I am excited to serve on the New and Developing Professionals Advisory Committee at Goddard, which interacts with employees as well as with senior management on topics such as knowledge transfer and attracting/motivating/retaining talent. I also enjoy being involved in NASA outreach.



To further the development of space science and space engineering, the Massachusetts Space Grant Consortium (MASGC) funds a multi-disciplinary educational program.

MASGC is a consortium of 4-year colleges and universities, community colleges and public outreach organizations. MASGC's primary goal is to represent NASA in Massachusetts to promote public understanding of and support for space exploration and research, and to encourage students to choose courses of study that will lead them to enter the technical work force.

One of MASGC's primary activities is providing opportunities to Massachusetts students in aerospace related education and research and to particularly encourage women and underrepresented minorities, to pursue careers in STEM fields.

Highlights of MA Space Grant Activities

- Undergraduate and Graduate Scholarships / Fellowships
- Summer Internship Program
- Space Science and Engineering Seminar
- Public Distinguished Lecturer Series
- Science Club for Girls – Rocketry Program
- Massachusetts Space Day
- K-12 Teacher Professional Development
- NASA Summer of Innovation – STEM Middle School Programs

Lead Institution

Massachusetts Institute of Technology

Affiliates

Boston University
Bridgewater State University
College of the Holy Cross
Framingham State University
Five College Astronomy Department
Harvard University
Maria Mitchell Observatory
Mount Holyoke College
Northeastern University
Olin College of Engineering
Roxbury Community College
Tufts University
University of Massachusetts (Amherst)
University of Massachusetts (Dartmouth)
Wellesley College
Williams College
Worcester Polytechnic Institute
Worcester State University

Institutional Affiliates (outreach)

Boston Museum of Science
Christa McAuliffe Center



Student Research funded by MASGC at Bridgewater State University (BSU)

This is an example of research done by a woman at a small state university in MA, where, unlike at the large well-known research universities in MA, the research would not have been possible without MASGC funding.

Observations of Exoplanet CoRot-2B by Kathryn St. Laurent



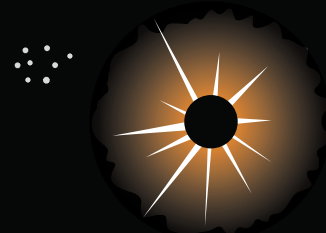
Posters on the Hill, a prestigious undergraduate research event in the country, sponsored by the Council on Undergraduate Research, has honored a BSU student **Kathryn St. Laurent**, a senior physics major, for her research entitled "exoplanets".

In Kathryn's words: "We intended to study one known extra-solar planet (Kepler B) and one extra-solar planet candidate (CoRot 2b) by making observations of their transits using the new observatory at Bridgewater State University (BSU). Follow-up observations of the target planets were planned using the radial-velocity method, time permitting. Unfortunately, due to poor observing

conditions and equipment that malfunctioned, we could not observe the targets from BSU. Instead we used a remote telescope run by Wheaton College. This completely automated system is located at the Grove Creek Observatory in Trunkey Creek, New South Wales, Australia.

Over a series of nights, we took calibrated images of CoRot 2B both during and out of transit. We used *MaxIm DL* to conduct differential photometry, using an artificial Gaussian check star and an averaged ensemble of reference stars for comparison. Sources of error include sky conditions, less than ideal calibration images, and tracking and alignment issues inherent in the telescope. Only data for the latter half of one transit were collected and are plotted below. These preliminary data looks promising, with a 'dip' of ~ 0.03 magnitudes and egress at JD 2456125.987500, as predicted by ephemerides provided by the Exoplanet Transit Database."

NASA/Michigan Space Grant Consortium



Consortium Description

Vision: The Michigan Space Grant Consortium (MSGC) fosters awareness of, education in, and research on space-related science and technology in Michigan.

Mission: To create, develop, and promote programs that support our vision and reflect NASA's strategic interests, and that encourage cooperation between academia, industry, state, and local government in space-related science and technology.

Objectives and Value Statements: Obtaining a diverse scientific workforce is a desirable outcome and will be necessary if the United States is to maintain a leading role in scientific research and technological development in the future. The MSGC contributes to the national need by recruiting a diverse group of students, researchers, and participants for all MSGC programs.

Summary of MSGC Programs

The purpose of the MSGC is to coordinate and improve Michigan's future in space science, aerospace, and technology with particular emphasis on assuring a diverse, well-trained workforce and an informed public. Our funding opportunities include:

- **The Fellowship Program** supports undergraduate and graduate students while they are working on research and public service projects and during internships at NASA Centers, in Industry, and at the University of Michigan.
- **The Research Seed Grant Program** helps junior faculty or research scientists develop research expertise necessary to propose research in new areas to other federal or non-federal funding sources.
- **The Pre-College Education Program** promotes programs and projects that encourage and enrich the study of mathematics, science, or technology, in general, and space science, aerospace, and aeronautics, in particular, for K-12 students.
- **The Public Outreach Program** supports conferences, workshops, publications, lecture series, and non-technical courses, science fairs, and radio and television programs that serve the general public with informal education.
- **The Teacher Training Program** promotes the innovative higher education of pre-service and in-service teacher training in aerospace, space, or Earth system science.
- **The K-12 Educator Incentive Program** supports teachers who attend conferences and engage in educational enhancement activities in mathematics, science, and technology. Support is also offered for classroom materials and supplies.

www.mi.spacegrant.org

Lead Institution

**University of Michigan
Department of Aerospace
Engineering**

1320 Beal Avenue
Ann Arbor, MI
48109-2140

Telephone: (734) 764-9508

Director

Professor Alec D. Gallimore

E-Mail: alec.gallimore@umich.edu

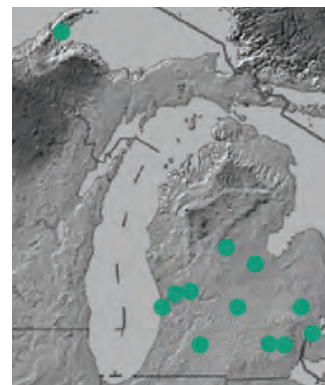
Program Administrator

Ms. Bonnie L. Bryant

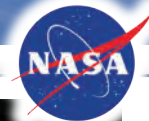
E-Mail: blbryant@umich.edu

Affiliate Members

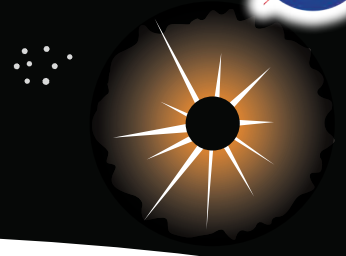
Calvin College
Central Michigan University
Eastern Michigan University
Grand Valley State University
Hope College
Michigan State University
Michigan Technological University
Oakland University
Saginaw Valley State University
Wayne State University
Western Michigan University



• Locations of MSGC affiliates



NASA/Michigan Space Grant Consortium



Encouraging Young Minds in the Space Sciences

Kimberly R. Trent

Ph.D. Candidate at the University of Michigan



Kimberly Trent assembles a PEPL lab-designed hollow cathode. The hollow cathode is the electron-producing component in Hall Thrusters.

The exploration of space and the propulsion systems that make exploration possible have always been of great interest to me, and it was through my high school experiences that I came to realize my equally strong regard for physics. I will never forget my first physics lecture during my junior year of high school. Our teacher, Mr. Zimmerman, started the lecture by playing a clip featuring the Wile E. Coyote and Road Runner cartoon characters. We laughed when The Coyote repeatedly launched a large rock off a catapult and it always landed on him no matter where he stood. Mr. Zimmerman pointed out that we found this to be funny because it was contrary to our actual experience of how physics works. This clever introduction caught our attention. It showed us that something we had instinctively found funny from childhood was actually due to a play on physics. Mr. Zimmerman continued to engage us with the energy he brought to the classroom, his passion for physics, and his ability to clearly convey his knowledge to us.

This first encounter with physics was a major influence in my decision to become a scientist and engineer, so I realize the great importance of actively engaging and encouraging students in these fields throughout the learning process to spark the interest of those who have not connected to science and math in the past and to foster the interest of those who have.

The Michigan Space Grant Consortium (MSGC) has played a large role in my pursuit of a Ph.D. in Applied Physics. I am currently conducting research in electric propulsion at the Plasmadynamics and Electric Propulsion Laboratory (PEPL) in Ann Arbor. In my dissertation research, I am investigating how the electron energy distribution function (EEDF) can be controlled in Hall-effect thrusters (HETs) to boost ionization efficiency. HETs are a type of electric propulsion device that are increasingly being used in satellites to perform station keeping and orbit transfers due to their high specific impulse. These devices ensure U.S. safety as tactical assets for surveillance, and are also a key factor in our nation's telecommunication and navigation devices. In 2008, the summer before I started the Applied Physics Ph.D. program at the University of Michigan, I was selected to intern at the NASA Space Academy located in Cleveland at the Glenn Research Center. My participation was made possible by the funding I received from the MSGC. This experience helped me to foresee a working environment that met my interests, and allowed me to gain research experience in propulsion physics before I began graduate school.

In addition, the MSGC Fellowship Program has provided me with auxiliary monetary support, so I could stay focused on my studies and maintain steady progress towards my educational goals. The space sciences are of great importance to our country's pursuit of knowledge and to our country's continued national security and technological infrastructure. I would like to see this invaluable program continue so that other students who are pursuing careers in this field and other STEM (Science, Technology, Engineering, and Mathematics) fields can also benefit from the support the MSGC provides to undergraduate and graduate students.

My professional goal is to become a professor at the university level where I will have the opportunity to stimulate students' interest in physics and aerospace engineering on a daily basis, and where I will also be able to continue conducting spacecraft propulsion research.



NASA/Minnesota Space Grant Consortium

Consortium Description

The mission of the Minnesota Space Grant Consortium (MnSGC) is to be the driving force in Minnesota for higher education in aerospace sciences, aerospace engineering, and other scientific and engineering fields directly related to NASA’s goals and the aerospace industry’s workforce needs. To accomplish this mission, the MnSGC created a diverse group of affiliates, selected to provide geographical diversity and to address State and NASA needs.

The MnSGC is focused primarily on NASA Educational Outcome 1 – *Educate and Employ*, but also supports activities related to NASA Educational Outcome 2 – *Educate and Engage* and, to a lesser extent, NASA Educational Outcome 3 – *Engage and Inspire*.

Retention of college students in STEM (Science, Technology, Engineering, and Mathematics) fields and the inclusion of women and under-represented groups, both faculty and students, are overarching goals in MnSGC programs and activities.

Summary of MnSGC Programs

The MnSGC provides NASA-related opportunities for higher education students and faculty, plus activities for pre-college teachers, their students, and members of the general public to better appreciate NASA accomplishments and career opportunities in STEM fields. Programming and student support fall into the following categories:



- Fellowships/scholarships for students in academic fields of interest to NASA
- Research in multiple STEM areas
- Funding of NASA Center Internships for students attending college in Minnesota
- Higher-education curriculum development in areas of interest to NASA
- Hands-on aerospace hardware projects including ballooning and rocketry
- NASA-related K-12 teacher workshops
- Aerospace-themed informal education events



Lead Institution:

University of Minnesota – Twin Cities

Academic Affiliates:

Augsburg College

Bemidji State University

Bethel University

Carleton College

Concordia College

Fond du Lac Tribal and Comm. College

Leech Lake Tribal College

Macalester College

Saint Catherine University

SW Minnesota State University

University of Minnesota – Duluth

University of Saint Thomas

State Government Affiliate:

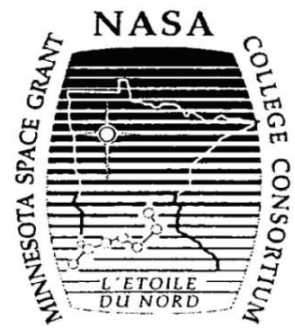
MN Department of Transportation – Office of Aeronautics



Sample Student Research Project

Abstract

Spin stall is a major contributor to many accidents in general aviation (GA) aircraft. A spin can be entered when stall develops asymmetrically on the wings, compromising the roll stability of the aircraft. The behavior of this asymmetric stall can be difficult to replicate with traditional fixed wind tunnel stings as they do not allow the model to move freely in roll. In order to investigate this behavior more completely, a new sting at the University of Minnesota needed to be developed. Modeled on the work done at the 16-foot Transonic Tunnel at NASA Langley Research Center as part of the Abrupt Wing Stall Program, and with contribution and oversight from the Minnesota-based company Cirrus Aircraft, the University of Minnesota (UMN) Free to Roll (FTR) project set out to design and build a sting that would allow a wind tunnel model freedom of movement in roll. The product of this effort was the UMN FTR sting. Currently the UMN FTR sting is being used in the University of Minnesota low-speed wind tunnel to investigate stall development and its contribution to wing rock in GA aircraft with high-aspect ratio wings. The FTR sting allows wing rock behavior to be observed and data on the stability of the aircraft to be collected. These data, along with video footage of the aircraft in motion, will help in understanding dynamic behavior of GA aircraft at high angles of attack. The results will also be of great help in the development and evaluation of attachments and wing modifications that may improve the stall characteristics and roll stability of GA aircraft at high angles of attack.



Impact Statement

My name is Dale Utt and throughout my years as an undergraduate aerospace engineering major at the University of Minnesota – Twin Cities I have been presented with many opportunities to enrich my learning experience through design-and-build projects. Whether it was designing a composite or developing a CFD model, each project was a fun yet challenging way to demonstrate the knowledge I had acquired and the skills I had developed in that area. No opportunity, however, has been as unique or impactful as the chance to work independently on FTR research,



advised by aerospace Professor Bill Garrard. Like nothing I had done before, this research project forced me to develop new skills, learn new material, and approach problems in ways unique from anything I had been exposed to in class-related exercises. This research has only been possible because of financial support from the Minnesota Space Grant Consortium (MnSCG). With the funds provided by the MnSGC I have been able to continue one of the most unique experiences of my life (so far), further growing my knowledge and love of the field of aerospace engineering.



**MISSISSIPPI
SPACE GRANT
CONSORTIUM**

MSSGC MISSION

The primary mission of the Mississippi Space Grant Consortium (MSSGC) is to strengthen science, technology, engineering, and mathematics programs throughout the state, enhance aerospace-related research opportunities at the undergraduate and graduate levels, inspire students to pursue careers in science, technology, engineering, and math (STEM), improve the state's scientific literacy by providing educators with innovative strategies for teaching math and science and to serve the general public by supporting programs that contribute to scientific literacy. These are accomplished through fellowships and scholarships, research opportunities, undergraduate and teacher training, K-12 outreach, and public education.

**SUMMARY OF
MSSGC PROGRAMS**

- Graduate/Undergraduate research scholarships fellowships
- Summer internships at NASA centers and Mississippi Aerospace-related industry
- Faculty research
- Student Rocket program, cube-sat program and high-altitude ballooning
- STEM teacher training and hands-on activities for K-12 educators to implement into their classrooms
- Higher Education Programs including mentoring, industry computer programming competition, student labs
- General Public presentations from the Rainwater Observatory

LEAD INSTITUTION | University of Mississippi

AFFILIATES |

- | | |
|--|---|
| <ul style="list-style-type: none"> Alcorn State University Delta State University Jackson State University Mississippi State University Mississippi University for Women Mississippi Valley State University University of Southern Mississippi | <ul style="list-style-type: none"> Coahoma Community College Hinds Community College Itawamba Community College Meridian Community College Mississippi Delta Community College Mississippi Gulf Coast Community College Northeast Mississippi Community College Pearl River Community College |
|--|---|

MISSISSIPPI SPACE GRANT CONSORTIUM (MSSGC)

Consortium Objectives

- 1) Strengthen science, technology, engineering and mathematics programs
- 2) Enhance aerospace-related research opportunities
- 3) Inspire students to pursue STEM careers.
- 4) Improve the state's scientific literacy
- 5) Support aerospace-related industries in Mississippi.

Government and Industrial Partners:

NASA Space Centers Kennedy, Stennis and Marshall, NASA JPL, Lockheed Martin Space Systems, NVision Inc, Alliant Techsystems (ATK), Innovative Imaging and Research, Radiance Technology

Education Partners

Rust College, Tougaloo College, Rainwater Observatory and Planetarium, Mississippi Center for Math and Science Education

Activities

MSSGC Programs

Graduate Fellowship Program

(12 MSSGC Awardees)

Research Infrastructure Program



The MSU Space Cowboys recently returned from the 2012 NASA USLI competition where they placed second overall out of 40 other colleges and universities (MIT, Calpoly, Georgia Tech, Virginia Tech, and many others). The team also won first place for their NASA SMD payload for the most innovative and creative SMD payload that maximized safety and science value. The team received an honorable mention for their 2012 educational engagement activities where they reached 2000 students (elementary to high school).

Higher Education Projects

- Industry Internships: CC Faculty fellowships (1) and (6) Students
- Internships with NASA Centers and Industry Partners (10)
- High Altitude Balloon Project (MSU), Rocket Program (MSU), and satellite program (UM)

K-12 Programs

Minigrant Program
K-12 Annual Teachers Conference:
2013 Conference with (65) MS middle school STEM teachers

Affiliate Programs

Scholarships/Fellowships
Research
Community Outreach
K-12 Programs
Higher Education Programs





Title of Research

A Design Space for Illustrative Methods in Information Visualization

Abstract

Traditionally information visualization methods are illustrative in that their depictions are abstractions and its inherent structure is not necessarily known beforehand e.g. a scatterplot. Though the rendering of information visualizations produces an abstract visualization in a holistic sense, the rendering via rasterization of visualization primitives tends to minimize extraneous details; every drawn pixel has a direct correspondence to raw or aggregated data. It is thought that a more expressive or artistic rendering of data might harness additional insight through abstraction, or even an emotional connection. Non-photorealistic rendering (NPR) is filled with research about mimicking artistic expression, other stylistic rendering approaches, and natural media like painting or sketching. But there is no systematic guidance on how artistic styles, from the NPR community, could apply to information visualization. My research will classify the NPR domain and experiment to determine which techniques pose a benefit to information visualization.

Non-photorealistic rendering has traditionally been applied to scientific visualization and this applicability has been supported by literature covering this topic. This relationship in some sense is warranted as scientific visualization typically relies on displaying data within some known data set with a known

structural representation e.g. MRI, weather or even cartographic data. An example of non-photorealism being useful for information visualization is when it is used in an “information hiding” sense. By rendering data with less detail, i.e. non-photorealistically, we can abstract away parts of the data which would hinder certain types of visual tasks.



Andrew Stamps

My research investigates if non-photorealistic rendering has applications which can enhance information visualization. Anecdotally it can be argued that it certainly does, as some of the same additional abstraction and other image and/or data manipulation properties that Non-photorealistic rendering has been used for in other areas like scientific visualization, would likely be useful in information visualization as well.

Area of Interest

Computer Science
[Information Visualization]

NASA-Missouri Space Grant Consortium



*2011 Annual Spring Meeting
University of Missouri – St. Louis*

Consortium Description

The NASA-Missouri Space Grant Consortium is comprised of academic institutions and organizations that are distributed throughout the state in areas ranging from fairly rural locations to high-density population centers. The research expertise of the Affiliates and Associates of the MOSGC are well balanced between engineering and science disciplines. The main Consortium strengths are in the areas of Aeronautics, Aerospace Engineering, Mechanical Engineering, Nuclear Science and Engineering, Physics, Astronomy, Astrophysics, Material Science, and Earth and Planetary Sciences. These specializations provide a great number of opportunities to contribute to the development of a new body of knowledge that is playing a central role in realizing NASA’s objectives and puts the Missouri Consortium in an excellent position to contribute to the development of the next-generation workforce, which will be a critical component for the implementation of NASA’s exploration vision.

Affiliate Members

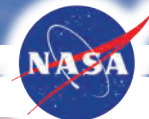
- Missouri University of Science & Technology (Lead Institution)
Department of Mechanical and Aerospace Engineering
- Missouri State University
Department of Physics, Astronomy, and Materials Science
- University of Missouri – Columbia
Department of Mechanical and Aerospace Engineering
Nuclear Science and Engineering Institute
- University of Missouri – Kansas City
Department of Physics and Astronomy
- University of Missouri - St. Louis
Department of Physics and Astronomy
- Washington University in St. Louis
Department of Earth and Planetary Sciences
Department of Energy, Environmental, and Chemical Engr.
Department of Mechanical Engineering and Materials Science
- St. Louis Science Center
James S. McDonnell Planetarium

Associate Members

- Challenger Learning Center
of St. Louis
- Lincoln University of Missouri
- St. Louis University
- Truman State University
- William Jewel College

Partners

- St. Louis Astronomical Society
- St. Louis Gifted Resource Council
- Spaceweek - St. Louis
- MEMC Electronic Materials
- The Space Museum
- Columbia Aeronautics
and Space Association
- Drury University

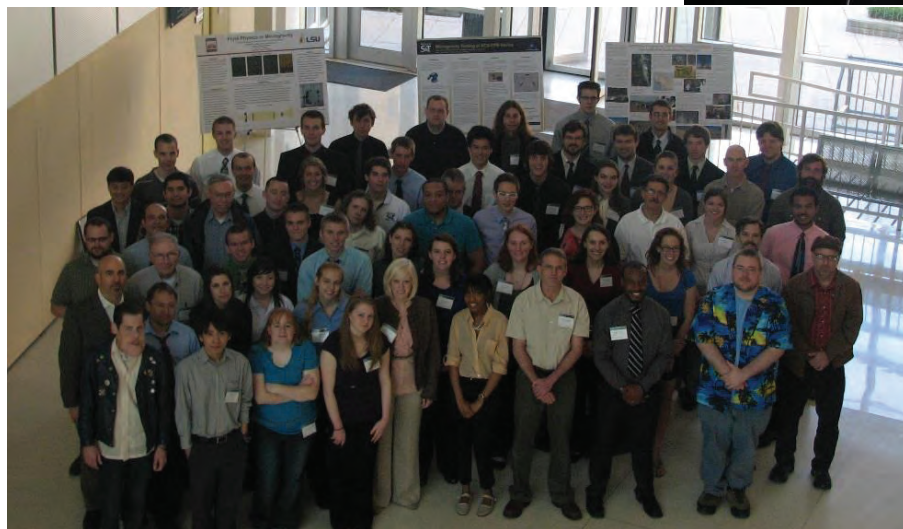


Consortium Mission and Goals

The mission of the NASA-Missouri Space Grant Consortium is to maintain and enhance the Nation’s workforce capabilities in aerospace and space related science, engineering, and technology through the State’s network of research universities and corporate partners; and to aid in the dissemination of NASA related information to students, faculty, researchers, and the general public. The specific goals of the Consortium are to inspire, motivate, recruit, educate, and train students at all academic levels to help meet Missouri’s and NASA’s need for skilled, knowledgeable, diverse, and high-performing professional scientists, engineers, technologists, and educators in the fields of interest to NASA. Over the past twenty-five years, the Consortium’s programs were strategically designed to respond to the State and NASA’s needs for educating and preparing students for STEM occupations in the aerospace and space related research, education, and industry.



***2010 Annual Spring Meeting
Missouri State University
Springfield, MO***



***2012 Annual Spring Meeting
Missouri University of Science & Technology
Rolla, MO***

Consortium Programs

***Fellowships & Scholarships,
Higher Education Internships,
and Research Infrastructure
Assistantships in Aeronautics;
Aerospace, Mechanical, and
Nuclear Engineering; Physics,
Astronomy, Astrophysics;
Material Science; and Earth
and Planetary Sciences.***

Higher Education Engineering Design Teams and Scientific Research Groups

- Society of Automotive Engineers AeroDesign Competition
- University Student Launch Initiative Competition
- NanoSat-7 Competition
- Micro-Gravity University Flight Opportunities
- The “Pathfinder” Collegiate Undergraduate Program
- Multidisciplinary Astrobiology Research Community

Pre-College

- High School Summer Internships
- Classroom Visits
- Planetarium Programs
- CASA Space Simulations
- Summer Space Academy
- New Horizons in Space
- Introduction to Engineering
- K-12 Teacher Training



Montana Space Grant Consortium



Student Satellites

Designed and built by students at MSU's Space Science and Engineering Lab, the Hiscock Radiation Belt Explorer (HRBE) is a Cubesat-class satellite named in honor of the founding Director of MSGC Dr. William A. Hiscock. HRBE was launched into space on October 28, 2011. Today the satellite continues to gather scientific data on the ionizing radiation environment of the Van Allen Radiation Belts.



BOREALIS

BOREALIS is MSGC's high-altitude ballooning program. In the program, students from a variety of majors work together to conceive, design and build payloads that are flown to 100,000 feet—the edge of space. BOREALIS programs are at Montana State University and the University of Montana.



Fellowships and Scholarships

Graduate fellowships and undergraduate scholarships are awarded annually to students pursuing studies in fields related to aerospace sciences and engineering. Since the formation of MSGC in 1991, over 115 graduate fellowships and 380 undergraduate scholarships have been awarded to Montana students.

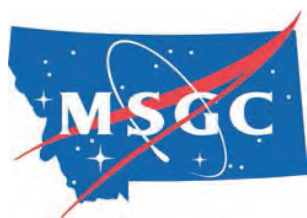
Space Public Outreach Team (SPOT)

MSGC's SPOT program promotes science and engineering education by sending specially trained undergraduates to visit Montana K-12 classrooms and public events, bringing exciting information about NASA's missions to Montana's youth. More than 110,000 Montana students have participated in presentations given by over 130 undergraduate presenters.

MSGC is...

Aurora Detectors and Ground Remote Sensing with Montana's seven Tribal Colleges; annual National Student Solar Spectrograph Competition; annual state-wide Student Research Symposium; Montana Aerospace Workshop; Montana Science and Engineering Festival; Faculty Research Grants; Education Enhancement Grants; Undergraduate Research Apprenticeships, Grants, and Programs; Student Research Awards; support for NASA competitions (MSU won the 2010 Lunabotics competition); support for NASA internships; annual Affiliates meeting; semi-annual Advisory board meeting; Affiliate campus visits + MORE!





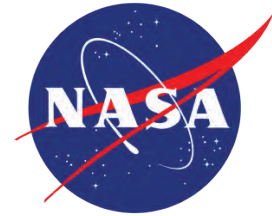
Student Highlight: Andrew Crawford

Andrew Crawford came straight out of Montana into an international pro snowboarding career. After a decade of snowboarding, he enrolled at Flathead Valley Community College, an MSGC affiliate. Andrew was offered a scholarship from MSGC in his pursuit of space-science related studies. While at his community college, he also competed in a nationwide NASA competition, National Community College Aerospace Scholars (NCAS), designing a theoretical Mars rover mission. Andrew's design was selected and he was chosen by NASA to go to Johnson Space Center in Houston, Texas to compete in another competition/internship. While at Johnson Space Center, Andrew was elected Lead Engineer for the competition and went on to lead his team to first place for the competition. Andrew was offered a mechanical engineering internship at NASA's Jet Propulsion Laboratory JPL in 2011, and on the side he started an educational blog called "Earth to Intern" that is managed by JPL's education department, showcasing the possibilities at NASA and JPL through education. The blog was a success, and continues today with guests including JPL's Director, Dr. Charles Elachi as well as the Mars rover drivers. Andrew transferred to Montana State University (MSU) in 2011 to continue his studies in mechanical/aerospace engineering, and while at school, has been working at MSU's Space Science and Engineering Laboratory (SSEL), building cube-satellites to be launched with NASA funded missions. He is an active member on the MSGC advisory board, and in 2011 was chosen to go to Washington, DC to speak at the National Space Grant Directors meeting, including speaking to NASA's associate administrator for education and Astronaut, Leland Melvin. Andrew returned to JPL for another mechanical engineering internship in the summer of 2012. Currently, Andrew is an intern at NASA Ames Research Center and was so grateful for the opportunity that he would "sleep in a boiler room and be happy with one penny just to have this experience". Andrew is a part classical violinist, part professional snowboarder and part mechanical/aerospace engineering student who is now a senior at MSU continuing his studies, and hopes to work for NASA and in the aerospace industry upon graduation.

His student research presentation at the annual research symposium was entitled "Mechanical Memoirs of a Space Mission". The presentation chronicled the intricate mechanical workings, fabrications, and processes, required for a successful "cradle to grave" space mission. The research follows a collaborative NASA and Montana State University Space Science and Engineering Laboratory (SSEL) mission, called EPISEM (Energetic Particle Integrating Space Environment Monitor) that consists of 14 identical spacecraft, all 1U CubeSats. The primary directive of the mission is to gather scientific data on the Van Allen radiation belts, as well as demonstrate the data transfer and "command" sending capabilities between multiple-spacecraft during flight. The presentation showed the conception-to-completion timeline of the mission, from a mechanical standpoint.



Andrew Crawford is the perfect example of how MSGC programs help Montana's students become tomorrow's aerospace leaders.



Our Mission:

The NASA Nebraska Space Grant Consortium funds innovative aerospace research and education programs, partnerships, and workforce development opportunities throughout Nebraska. These activities allow Nebraska faculty and students to become leaders in aerospace research and offer cutting-edge education programs.

The NASA Nebraska Space Grant program is a statewide effort to foster the future of Nebraska's STEM workforce. Through our network of 19 academic, governmental, non-profit, and industry affiliates we work to engage Nebraska students in NASA-related content and activities.

An emerging partnership between the Strategic Air & Space Museum, the University of Nebraska at Omaha (UNO), and the Nebraska Space Grant will provide Nebraska students and the general public with new opportunities to engage in robotics, astronomy, high-altitude ballooning, and other NASA-related activities.

Select Projects

Western Nebraska Community College

- Johnson Space Center (JSC) Career Exploration Workshop

College of St. Mary

- Science Education Outreach

University of Nebraska - Lincoln

- AIAA Chapter Competitions
- RockSat-C & NASA Goddard

Creighton University

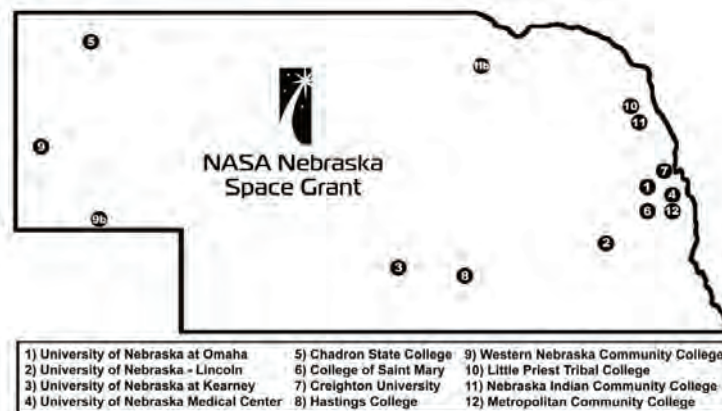
- NASA Internships
- Water Quality Research

Metropolitan Community College

- High Altitude Ballooning Course
- Cosmic Ray Detection Project

University of Nebraska at Omaha

- New Teacher Training Program with Kennedy Space Center
- Nebraska Biomechanics Core Facility



NASA Nebraska Space Grant Consortium | 6001 Dodge Street | CB 041 | Omaha, NE 68182
<http://www.ne.spacegrant.org> | NASA.Nebraska@unomaha.edu



NASA Nebraska Space Grant



Alexandra Toftul is a Master's student in Electrical Engineering at the University of Nebraska-Lincoln (UNL). Her Nebraska Space Grant research on high-power plasma drive solid state switching for Pulsed Inductive Thrusters (PITs) is a collaboration with the Electric Space Propulsion Laboratory at NASA Marshall Space Flight Center (MSFC).

As an undergraduate student, Alexandra completed a total of four internships at NASA, including three at MSFC and one at Dryden Flight Research Center (DFRC). During these internships, she had the opportunity to work on a variety of projects, including the development of laser gyroscopes, in-space electric propulsion systems, and visualization algorithms for fiber optic aircraft wing-shape sensors. The variety of valuable experiences and connections she acquired allowed her to return to NASA as a graduate student.

Currently, Toftul is a Pathways Internship Program engineering trainee working in the Systems Engineering group at NASA-MSFC.



Her current project involves documentation of command and data handling between the Space Launch System (SLS) launch vehicle and Ground Systems Development and Operations (GSDO). She is also involved in the design of the NanoLaunch1200 orbital launch vehicle that will allow for low-cost delivery of CubeSats to orbit.

Upon graduation from the Master's program at UNL, Toftul hopes to convert to a full-time position at NASA MSFC and continue to support the development of the SLS vehicle.

Nevada NASA Space Grant Consortium

Consortium Description

Mission

The overall goal of the Nevada NASA Space Grant Consortium is to create and expand opportunities for Nevada students and faculty to be active and valued



We target hands-on workforce training and research in areas of astrobiology, astrophysics, planetary geology and geophysics, and engineering. Established NVSGC goals & objectives enhance the ability of the Consortium to ensure program success and:

- Increase participation by underrepresented groups
 - Develop the capacities of Nevada students and faculty to participate in or host competitions
 - Establish formal mentoring and student recognition programs
 - Formalize industrial partnering relationships to increase opportunities for internships, externships and student interactions with industry
 - Increase the number of applicants for internships and academy positions at NASA centers
 - Establish new courses within the NSHE institution's curricula
- Continue to increase the number and quality of applicants for fellowships and scholarships

The Nevada NASA Space Grant Consortium was established in 1991 with a grant from the National Aeronautics and Space Administration NASA and is comprised of Nevada's eight state institutions of higher learning.

We support the national agenda to develop a strong math, science, engineering and technology education base through the funding of research and higher education programs, and by supporting students through scholarships, fellowships and internships, and by partnering with industry and local government.

Consortium Members

- | | |
|---|-----------------------------------|
| University of Nevada, Reno | University of Nevada, Las Vegas |
| College of Southern Nevada | Truckee Meadows Community College |
| Western Nevada College | Nevada State College |
| Great Basin College | Desert Research Institute |
| Summit Products | Equipment Links, Inc. |
| Sierra Particle Technologies | The Planetarium |
| Jack C. Davis Observatory | |
| Fleischmann Planetarium & Science Center | |
| Challenger Learning Center of Northern Nevada | |

The Nevada System of Higher Education has two designated Minority-Serving Institutions including the University of Nevada, Las Vegas and Nevada State College.



FUNDING PROVIDED BY NASA GRANT NUMBER NNX10AN23H



Nevada NASA Space Grant Consortium



Student STEM Research

Highlights



Brendan O'Toole

University of Nevada, Las Vegas

Three-hour modules were developed that provided workshops for K-12 STEM educators and students. This training enabled additional hands-on workshops for over 150 middle and high school students demonstrating the leveraging and "ripple" effect that is common among our Nevada Space Grant programs.

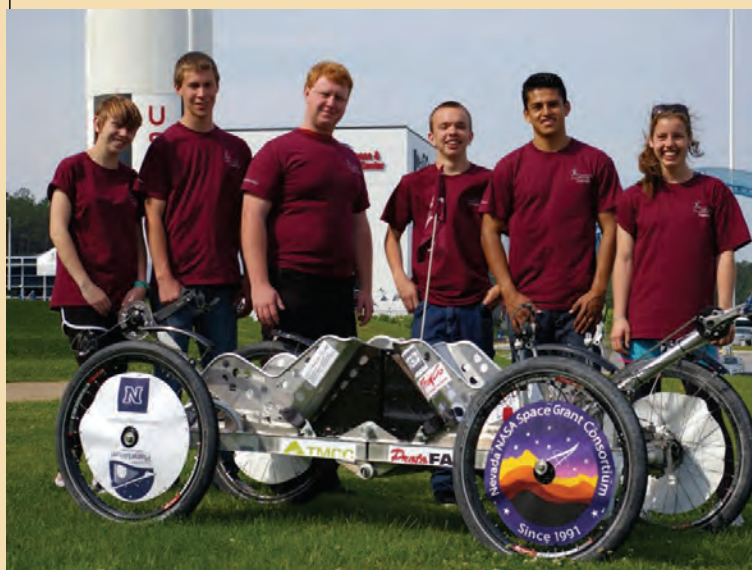
This dynamic class was created through the **NASA Space Grant Hands On Training** award at the University of Nevada, Las Vegas

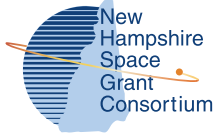


Nevada Students Make and Break Moonbuggys!

The **Nevada Moonbuggy Program** is a project that successfully created teams that have competed and won honors on the national stage. The program brought together local school districts and industrial sponsors to support the team's activities and pulled high school students into the STEM pipeline.

During the latest competition the team intentionally sought a light weight design. In initial performance testing the frame failed; however, the design team re-engineered their system that competed and then won the engineering design award. As a result of this engaging successful hands-on programs- 100% of the recent high school participants have gone on to enroll in engineering programs in Nevada and are engaged in STEM disciplines- making this another example of a truly engaging conduit that fosters training and development from K-12 to Higher Education.





New Hampshire Space Grant Consortium

The New Hampshire Space Grant Consortium brings together New Hampshire's educational and scientific community in a collaborative effort to inspire and educate future scientists and engineers. The consortium includes nine higher education, science education and industry affiliates from across the state, led by the University of New Hampshire (UNH). Find out more at www.nhsgc.sr.unh.edu

Program Highlights



University of New Hampshire space scientists mentored a FIRST Robotics team, the Oyster River High School "Bobcats," in building a robot to meet this year's FIRST engineering/design challenge. The team finished in the quarter-finals, 19th out of 40 teams.



Dartmouth College's Wetterhahn Symposium celebrates undergraduate scientific research and the Women In Science Project, fostering a supportive academic environment to women in the sciences.

Plymouth State University meteorology students are modeling weather conditions, including icing conditions on Mt. Washington. In summer 2012 they visited NASA KSC to test models.



The McAuliffe-Shepard Discovery Center's Aerospace Festival celebrates space science and aeronautics with activities, speakers, and exhibits.

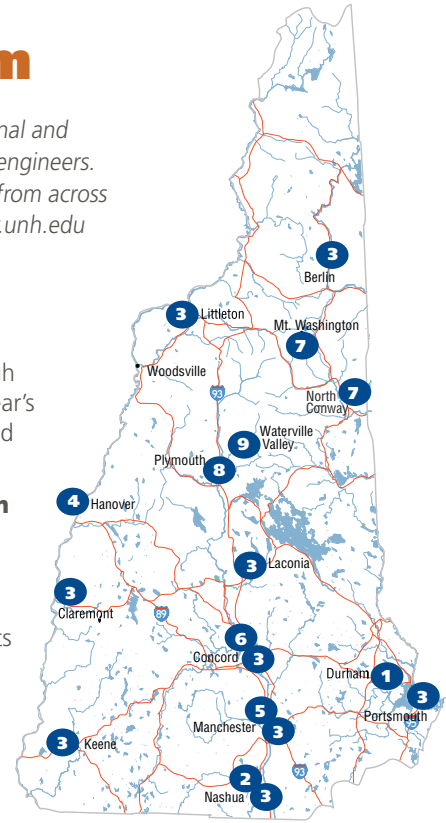
FIRST sponsors Women in Science and Technology forums encouraging middle and high school students to consider STEM discipline careers.



Mt. Washington Observatory brings Extreme Weather Observations to N.H. classrooms through distance learning. Students visit Mt. Washington in winter to learn about weather and data collection.

The Community College System of NH provides 25 Space Grant Scholarships to encourage careers in STEM disciplines and offers a STEM summer camp for students entering grades 6-8.

The Margret and H. A. Rey Center's "Welch Ledges Stewardship & Citizen Science Program" educates students on ecology and conservation and utilizes volunteers to collect data and help educate hikers about protecting this fragile environment.



NH Space Grant Lead Institution

- 1 University of New Hampshire (Main campus)

NH Space Grant Consortium Affiliates

- 2 BAE Systems of North America
- 3 Community College System of NH (with 9 campuses across the state)
- 4 Dartmouth College
- 5 FIRST
- 6 McAuliffe-Shepard Discovery Center
- 7 Mount Washington Observatory (and Weather Discovery Center)
- 8 Plymouth State University
- 9 The Margret and H.A. Rey Center

Photos, top left to bottom right: NHSGC-sponsored FIRST Robotics Team, Dartmouth College Wetterhahn Symposium, Plymouth State University master's student Cort Scholten with meteorology research poster, McAuliffe-Shepard Discovery Center Aerospace Festival, student volunteer with Rey Center's Welch Ledges stewardship program, FIRST Women in Science and Technology forum, Mt. Washington Observatory Extreme Weather Distance Learning program, and STEM summer camp students at Community College System of New Hampshire.



Featured Student Research



Katie Laro, Plymouth State University graduate student



Thunderstorms such as the one pictured above can cause major impacts for range activities at Kennedy Space Center. Katie's research project involves extending the KSC datasets of warm-season convective wind climatology used in forecaster training, and also testing low-cost lightning detectors.

Katie Laro

Master's student in Meteorology
Plymouth State University, Plymouth, New Hampshire

2009-2012 NH Space Grant Undergraduate Scholar;
Summer 2010 Intern, Kennedy Space Ctr./Cape Canaveral Air Force Station;
Summer 2013 Research Support at Kennedy Space Center

Meet Katie Laro, a Plymouth State University (PSU) graduate student who was a NH Space Grant scholar (2009-2012) while completing her undergraduate degree at PSU.

In her senior year of undergraduate work in the PSU meteorology program, Katie competed for the opportunity to present her research at *Posters on the Hill*, a consortium for undergraduate researchers in Washington, D.C. She was one of 73 students, selected from a pool of over 850 applicants, who presented to members of U.S. Congress on April 23-24, 2012.

Her research focused on updating the Kennedy Space Center (KSC)/Cape Canaveral Air Force Station (CCAFS) Warm-Season Convective Wind Climatology by adding data for years 2008-2011, which extended the coverage from 1995-2011. This experience, along with encouragement from faculty mentors, has inspired her to continue with graduate work in Meteorology at PSU.

With NH Space Grant support, Katie was able to explore the world of research as an undergraduate. "During the summer of my sophomore year," Katie explains, "and in the entirety of my senior year as an undergraduate, I was fortunate to be working on updating convective wind climatology research. While facilitating this research, I learned that I enjoy this type of work, and it is now a potential career path that I may take. It has inspired me to continue learning, to not accept things as they are, and to keep striving for more in my education and in the field of meteorology. One of my personal aspirations is to have an impact on the weather society as a whole. With the assistance of the Space Grant, I am now able to work towards this goal."

Areas of Interest

Science, Mathematics, and Technology

Research Description

Thunderstorms can cause major impacts for range activities in the Kennedy Space Center (KSC)/Cape Canaveral Air Force Station region. Lightning and convective winds from thunderstorms, especially during May through September (warm season), are the principal phenomena causing problems for these activities. Because of this, the range has established a state-of-the-art lightning detection system, weather towers, radar, and other observational systems to provide weather advisories and warnings.

The first aspect of this project involves testing a low-cost lightning detector being developed by AIRMAR, a New Hampshire company, to see how well it performs when compared to probably the best lightning detection system in the world. If the sensor performance is good, it offers an alternative for NASA and other agencies, businesses, and individuals to obtain reliable and inexpensive lightning detection capability.

The second aspect of the project is to synthesize convective wind data gathered for 18 warm seasons (1995 through 2012) and to assist in writing a scientific journal article to report on this unique data set. Currently, data are used for forecaster training and as decision aids for supporting range operations.



New Jersey Space Grant Consortium

Background

The New Jersey Space Grant Consortium (NJS GC) is NASA’s educational arm in New Jersey for higher education, charged with progressing the goals of the National Space Grant program.

Objectives and Programs

The objectives of NJS GC are to develop programs to further space science, aerospace and STEM (science, technology, engineering, mathematics) education, as well as to foster research and development in New Jersey. NJS GC acts through its affiliates as an umbrella organization, coordinating and developing space science and aerospace-related, high technology, educational and research efforts throughout New Jersey. NJS GC creates and encourages educational and research networks. It acts as a point of contact in New Jersey for space science and STEM education, partnership building and in engaging students and non-students in activities that are in NASA’s educational framework.

In fulfillment of its mission, NJS GC

- Provides undergraduate and graduate level fellowships,
- Assists curriculum and lab development,
- Provides seed funding to support cutting edge research initiatives,
- Supports student research clusters at N.J. academic institutions,
- Recruits female and minority students in STEM education and research,
- Supports K-12 science teacher training programs,
- Supports planetariums and informal science education programs.



Around 90% of NJS GC fellowship and scholarship recipients have gone on to graduate study or employment in STEM.

Affiliate Institutions

Bloomfield College, Georgian Court Univ., Liberty Science Center, N.J. City Univ., N.J. Inst. of Technology, N.Y. City Research Initiative, Princeton Univ., Astronomy Education Ctr. at Raritan Valley Community Coll., Rowan Univ., Rutgers Univ. (lead institution), Seton Hall Univ., Stevens Inst. of Technology, The College of N.J.

Contact Information

Director: Haim Baruh, Ph.D. (baruh@jove.rutgers.edu)

Program Coordinator: Joseph S. Miles (jmiles@stevens.edu)

Project Coordinator: Aiesha F. Long (aieshalo@rci.rutgers.edu)

Main Office: Room B-134 School of Engineering Building, Rutgers University, 98 Brett Rd., Piscataway, N.J. 08854. Phone: 848-445-2410, Fax: 732-445-7067, njsgc.rutgers.edu

Branch Office: B-107 Burchard Building, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, N.J. 07030. Phone: 201-216-8964.





NJSGC Programs at a Glance

Fellowship Programs

- **Academic Year Fellowships**
One year fellowships for undergraduate students, to conduct research in STEM or space sciences.
- **Summer Fellowships**
Summer fellowships for undergraduate students to conduct research at N.J. universities or in industry.
- **NASA Centers and NASA Academy**
Undergraduate or graduate level research at a NASA Academy or at a NASA center.
- **Graduate Student Fellowships**
Fellowships for graduate students conducting research in STEM and/or aerospace fields.



Research Programs

- **Mentored Research Clusters**
Grants to student research clusters in N.J. colleges for summer research.
- **Collaborations with N.J. Research Centers**
Support of the activities of research centers on aerospace and astronomy in New Jersey.
- **Suborbital Flight and Payload Research**
Support of students at Princeton University to conduct research on suborbital flight.
- **Travel Support for Researchers**
Travel support for students to attend conferences.
- **Research in Science and Education**
Support of minority students to conduct research at New Jersey doctoral institutions.

Higher Education Programs

- **Senior and Multi-Year Project Support**
Support of space science, exploration or aerospace related senior projects in N.J. universities.
- **Co-Op and Internship Program**
Placement of N.J. undergraduate students in co-op programs and internships.
- **Space Science and STEM Course Development**
Grants for development of new courses in N.J. universities in space science or STEM.
- **Minority Graduate Student Development**
Programs to recruit and mentor minority students and train them for graduate study. Summer as well as yearlong awards.
- **Bridge Programs for STEM Education**
Programs that combine high school and college students to encourage and promote science study. Supported programs include NYCRI (at NASA GISS), TARGET (at Rutgers), GIST (at GCU), EOF offices, and Liberty Science Center.
- **Rock-On and Rock-SAT with NASA**
N.J. college faculty and students attend the Rock-On and Rock-Sat workshops on sounding rockets, launching payloads 75 miles into space.

Pre-College Programs

- **STEM Teacher Training**
Support of in-service and pre-service K-12 science teacher training programs statewide.

Informal Education Programs

- **Planetarium Support**
Support of planetariums statewide.





NEW MEXICO SPACE GRANT CONSORTIUM

Consortium Description

The mission of New Mexico Space Grant Consortium (NMSGC) is to make the once difficult easy. In order to do so, the primary goals of NMSGC are to:

- Take advantage of our location and proximity to Spaceport America to provide a link to commercial launch opportunities for students and faculty
- Enable commercial space industry development by highlighting NASA and NMSGC programs and capabilities
 - Program: Student Launch Program/Annual Access to Space from Spaceport America
- Communicate our unique programs to local, state and national leaders
 - Annual International Symposium for Personnel and Commercial Spaceflight (ISPCS)
- Increase our collaboration with STEM education partners.
 - Capstone Design Classes

Summary of NMSGC Programs

NMSGC programs enable advancement in STEM and space related research for all students, faculty, and civilians in New Mexico. NMSGC programs:

- Annual International Symposium for Personal and Commercial Spaceflight (ISPCS)
- Student Launch Program/Annual Access to Space
- Undergraduate Research Scholarships
- Graduate Research Fellowships
- Internships at NASA Field Centers
- Summer of Innovation (SOI)
- Research Enhancement
- Capstone Design Classes

Lead Institution:

New Mexico State University

Affiliates:

Eastern New Mexico University

Jacobs Technology

NASA White Sands Test Facility

Navajo Technical College

New Mexico Highlands University

New Mexico Institute of Mining and Technology

New Mexico Spaceport Authority

New Mexico State University – Dona Ana

Northern New Mexico College

Southwestern Indian Polytechnic Institute

Spaceport America Consultants

University of New Mexico

Western New Mexico University





From Zero to Space The Role of NMSGC in One Person's Life



Gerardo, previously a citizen of Mexico, had to rely on private funds

Gerardo, now a U.S. citizen, can be funded by NASA Flight Opportunities

"I can honestly say that programs such as those offered by Space Grant have given students such as myself a unique and valuable opportunity to pursue very practical and hands on research. Space Grant has given the IPAV group a means to simulate microgravity and weightlessness that otherwise is not conceivable in a lab. Such a condition is very necessary for our space related research." Gerardo Martinez

Student Research

Suborbital Test of a Robotics-Based Method for In-Orbit Identification of Spacecraft Inertia Prop

Gerardo Martinez, New Mexico State University

Gerardo Martinez is a graduate student at New Mexico State University (NMSU), currently pursuing his Master's degree in Mechanical Engineering. Gerardo has lead three capstone groups in the past. He has presented in multiple local, national and international conferences as well as mentored high school and community college students. More impressively, after he graduated from NMSU with his Bachelor of Science in Mechanical Engineering and a minor in Aerospace Engineering, he was awarded the highly competitive merit based national NSF Graduate Research Fellowship award. He has participated in both 2008 and 2009 IPAV C-9 projects (an experiment that NMSU students designed to obtain experimental data for validating an inertia property identification technology). He has managed the design for the tentative launches with Masten Space Systems, and UP Aerospace.

Gerardo's mentor is Dr. Ou Ma, a professor in the Mechanical Engineering Department; he is the principal investigator of the project. Gerardo is project manager and chief engineer of the "Suborbital Test of a Robotics-Based Method for In-Orbit Identification of Spacecraft Inertia Prop" project. The goal of this research project is to experimentally verify a robotics-based method for on-orbit identification of satellite inertia properties in microgravity environment.

Due to the relative complexity of the flight experiment, a two-step (two-launch) approach has been proposed. The objective of the first launch is to test the effectiveness of a restrain/release and capture/restrain techniques for the free-floating SOF. This launch will take place through NMSGC using an UP Aerospace Spaceloft XL rocket at Spaceport America in October 2013.



Inertial properties sensor experiment



Gerardo (left) and Dr. Ma (right) with their experiment



Payload to go on Up Aerospace rocket

NASA/New York Space Grant Consortium



Consortium Description

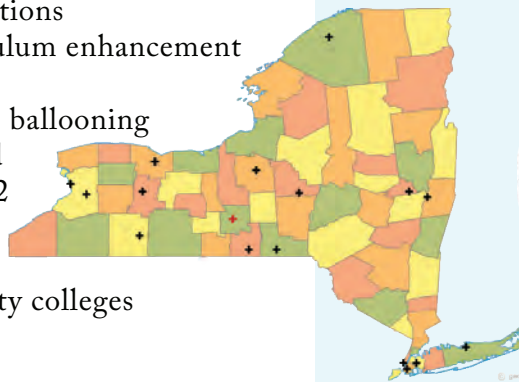
The primary objectives of the New York Space Grant (NYSG) are to enhance educational programs and encourage students to pursue careers in science, technology, engineering, and math (STEM). These are accomplished through fellowships and scholarships, research opportunities, undergraduate and teacher training, K-12 outreach, and public education. New York State has a diverse population of 19 million+ and we aim to try benefiting all.

The New York Space Grant seeks to make STEM a wondrous experience for all students, particularly in under-served/under-resourced schools and areas of the state. Our impact can be found in every student who has achieved a goal, be it a PhD in physics or writing a science essay for radio broadcast.

Summary of NYSG Programs

NYSG programs provide a foundation for building brighter futures in STEM career fields, helping to advance science and technology with the next generation. They are summarized as follows:

- Undergraduate research and scholarships
- Graduate research and fellowships
- Summer internships at NASA centers, NY State industry, and NYSG institutions
- Faculty research and curriculum enhancement grants
- CubeSats and high-altitude ballooning
- STEM teacher training and hands-on activities for K-12 students
- NYSG lectures at K-12 schools and community colleges



Lead Institution:

Cornell University

Affiliates:

- Alfred University
- Barnard College
- City College of New York, CUNY
- Clarkson University
- Colgate University
- Columbia University
- Lockheed Martin
- Medgar Evers College, CUNY
- Moog Inc.
- Polytechnic Institute of NYU
- Rensselaer Polytechnic Institute
- Rochester Institute of Technology
- Sciencenter
- SUNY Binghamton
- SUNY Buffalo
- SUNY Geneseo
- SUNY Stony Brook
- Syracuse University
- Union College
- University of Rochester
- York College, CUNY





NASA/New York Space Grant Consortium

Student Research

Ionospheric Dust Collection Utilizing Aerogel and Sounding Rocket Technologies

Iona Brockie, Cornell University



My name is Iona Brockie and I am a mechanical engineering student at Cornell University. In 2012, during the summer after my sophomore year, I did research with funding from the New York Space Grant Consortium. My research advisor was Michael Kelley, an Electrical and Computer Engineering professor who studies atmospheric phenomena. He hopes to sample, return, and analyze dust particles from the ionosphere. These particles are comprised mostly of the remains of meteors that were destroyed while entering Earth's atmosphere. They are challenging to obtain as the altitude is slightly too low for orbiting spacecraft and slightly too high for instrument-carrying balloons.

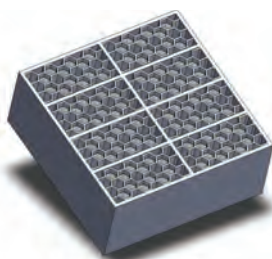
The solution is to use a sounding rocket. My task for the summer was to create the mechanical design for the sounding rocket payload. The final design includes an array of eight aluminum cells that are open on both ends. The bottom of the array is protected by a single lid powered by a servo motor. The top of each cell is protected by its own individual lid, again powered by a servo motor, capable of opening and closing on command during the rocket flight. Each cell is filled with aluminum honeycomb. Some of the holes in the honeycomb contain stacked slices of hexagonal aerogel, and some are left empty. Aerogel has a history of being used for particle collection. Gradient-density aerogel was developed for NASA's Stardust mission, which collected particles by maneuvering a spacecraft into a comet's tail. This project will utilize aerogel slices rather than large bars, since the analysis method (developed by Prof. William Tong at San Diego State University) requires the samples to be dissolved and turned into a solution.

The multiple, individually controlled box lids allow different pieces of aerogel to be exposed at discrete points during the rocket's flight, as shown below in the trajectory diagram. The details of the servo motors and their interaction with Cornell's COUGAR Global Positioning System receiver were formulated by Alex Hirzel, a student from Michigan Technological University. The first two boxes to close serve as control samples, documenting any contamination of the aerogel during assembly and launch. The bottom lid and empty honeycomb holes allow air to flow through the payload, ensuring particles will hit the aerogel and not be deflected around the rocket. O-rings create a waterproof seal that protects the samples during the water recovery at the end of the flight.

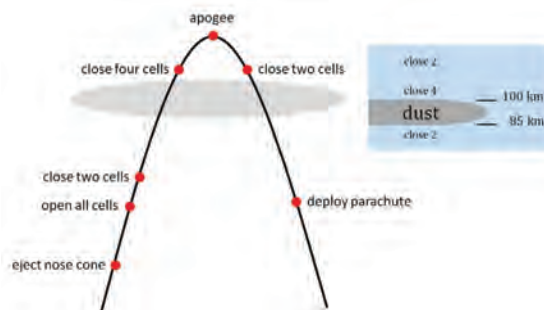
Clean aerogel samples have been sent to the lab in San Diego for initial tests. If the tests are successful and funding is secured, the project will fly with my payload design. This was an exciting and rewarding experience, and I would like to thank the New York Space Grant Consortium for the opportunity.



Ms. Brockie and sounding rocket shell (Cornell Univ. Photography)



Aerogel design sample



Flight trajectory diagram depicting staggered exposure of aerogel to collect ionospheric dust

www.ncspacegrant.org



DEVELOPING NORTH CAROLINA'S FUTURE AEROSPACE WORKFORCE

NC Space Grant is an active member of NASA's National Space Grant College and Fellowship Program. NC Space Grant partners with industry, non-profit, and federal/state government agencies to support STEM education in North Carolina. Since 1991, NC Space Grant has managed and provided over \$14 million in support to NC citizens. NCSG uses NASA funding supplemented by resources from the NC General Assembly, industry and non-profit partners to support students and faculty throughout the state. For every dollar that NC Space Grant receives from NASA, more than \$1.10 is matched from other sources.

NC SPACE GRANT PROGRAMS

Fellowship and Scholarship:

- Research fellowships and scholarships for graduate/undergraduate students
- Internships at NASA centers and industry
- Scholarships for preservice teachers, community college students

Research Infrastructure:

- Early career faculty research

Higher Education:

- Interdisciplinary course development
- Senior design and team competition support (NASA Lunabotics, NASA University Space Launch Initiative, Shell Eco-Challenge, SAE Aero Design East)

K-12 Education:

- Professional development for preservice, inservice, and informal educators
- Support the Student Spaceflight Experiment Program initiative with Guilford County Schools

Informal Education:

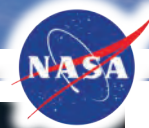
- NC Science Festival Statewide Star Party
- Astronomy Days at the NC Museum of Natural Sciences
- Weightless Lumbees outreach to American Indian youth
- Annual support of STEM initiatives (summer camps, public events) across the state

NC SPACE GRANT AFFILIATES

- Appalachian State University
- East Carolina University
- Elizabeth City State University
- Duke University
- NC A&T State University
- NC Central University
- NC Community College System (58 campuses)
- NC State University (Lead Institution)
- University of North Carolina at Asheville
- University of North Carolina at Chapel Hill
- University of North Carolina at Charlotte
- University of North Carolina at Pembroke
- Winston-Salem State University



NC Space Grant
911 Oval Drive, Engineering Bldg III
NCSU Campus Box 7515
Raleigh, NC 27695
919.515.4240



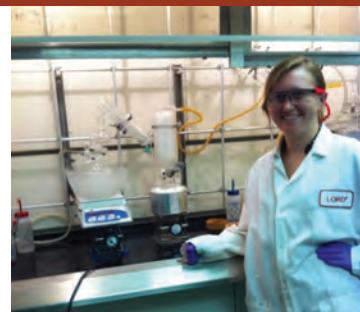
www.ncspacegrant.org



PROGRAM HIGHLIGHTS

NC SPACE GRANT/LORD CORPORATION SUMMER INTERNSHIP PROGRAM

- Internship open to **undergraduate and graduate** students enrolled in a STEM degree program at one of NCSG's thirteen Affiliate institutions.
- Selected students participate in a **10-week hands-on internship** at the Lord Corporation's world headquarters in Cary, NC; all students are assigned to a research project and are **supervised by a Lord engineer/scientist**.
- Since 2008, **39 students have participated** in the program; 10 students continued to work at Lord after the internship concluded; **5 former interns are now employed full-time at LORD**.



NASA FLIGHT FELLOWS PROGRAM—STEM IN AEROSPACE AND AERONAUTICS



- NCSG is a partner on a NASA K-12 Cooperative Agreement Notice awarded to the NC Science, Mathematics and Technology Center to build a sustainable coalition of high school teachers, research scientists and industry leaders in NC.
- Through the two year project, **21 expert high school STEM teachers** will learn about contemporary aerospace science and will **develop innovative, locally relevant curriculum** using **NASA educational resources** to **motivate students to pursue STEM study and careers** in aerospace.
- Each Flight Fellowship includes a mentored summer research externship and professional development institutes.

STUDENT SPACEFLIGHT EXPERIMENT PROGRAM

- NCSG provides leveraged support for the **Guilford County School System** to participate in the Student Spaceflight Experiment Program, a partnership between the National Center for Earth and Space Science Education and NanoRacks, LLC.
- **Middle and high school students conduct microgravity experiments and submit proposals** to compete for an experiment slot in a research mini-lab that is reserved just for their school district.
- **Two middle school teams have already flown their experiments in space.** In 2011, a team from Mendenhall Middle flew a brine shrimp experiment on the final mission of Space Shuttle Endeavor (STS-135) (July 2011). In 2012, a team from Johnson Street Global Studies tested the effect of gravity on mold growth. Their experiment flew to the International Space Station on the SpaceX Dragon (October 2012).
- The next experiment to fly will be from a team at the STEM Early College at NC A&T State. Their geotropism experiment will fly to the ISS on SpaceX-3 (launch scheduled for September 2013).





Description

The main objective of the North Dakota Space Grant Consortium is to provide and support opportunities for our students to pursue research in science, technology, engineering, and mathematics (STEM) fields and prepare them for careers that support NASA's goals and the high-tech workforce development needs of North Dakota. This is done through scholarships, fellowships, student internships at NASA centers, team research projects, pre-service and in-service educator workshops, faculty research and curriculum development in STEM fields, and various public outreach activities across the state.

Summary of Programs

Teams from North Dakota compete in:

- AIAA Design, Build, Fly Competition
- University Student Launch Initiative (USLI)
- Lunabotics Mining Competition
- Great Moonbuggy Race
- CubeSat Launch Initiative
- FIRST Robotics

The NDSGC supports the Near-Space Balloon Competition (NSBC), a statewide competition where middle and high school teams design, build, and launch scientific payloads on a high altitude balloon. Unmanned Aircraft Vehicle (UAV) research is also funded, with a focus in the area of precision agriculture. Public outreach events include tours of the UND Observatory and Space Studies Department, star parties, space camps, traveling planetariums, participation in community events, and visits to K-12 classrooms.

Affiliates:

Bismarck State College
 Cankdeska Cikana Community College
 Dakota College at Bottineau
 Dickinson State University
 Fort Berthold Community College
 Gateway to Science Center
 Grand Forks Herald
 Lake Region State College
 Mayville State University
 Minot State University
 North Dakota Heritage Center
 North Dakota State College of Science
 North Dakota State University
 Sitting Bull College
 Turtle Mountain Community College
 University of North Dakota*
 United Tribes Technical College
 Valley City State University
 Williston State College

*Lead Institution



Student Research

Promoting STEM Education in North Dakota with High Altitude Balloons

Marissa Saad, Department of Space Studies, University of North Dakota

For the past two years, I have had the opportunity to have a graduate research assistantship (GRA) with the North Dakota Space Grant Consortium. While attending the University of North Dakota and working towards a Space Studies Master's degree, my advisor, Dr. Ron Fevig, introduced me to High Altitude Ballooning. I was taught the technical side and educational benefits of ballooning, which I will use throughout my academic and professional career.

Since I started the GRA back in 2011, I have been involved with NASA's High Altitude Student Platform (HASP). This is a national zero-g balloon launch out of Fort Sumner, New Mexico. Payload slots are awarded to a select



number of universities, and working with great team members, we have been awarded a spot both years. The payload we are currently constructing is set to launch late August 2013. It will study the ozone profile in the atmosphere using nanocrystalline sensors.



file in the atmosphere using nanocrystalline sensors.

I was fortunate enough to be involved in another student-based project. We established an annual Near-Space Balloon Competition (NSBC), a payload competition for all middle and high schools in the state of North Dakota. In small teams, students conceptualize scientific experiments, design, and construct their payloads.

head, Minnesota.

As I am approaching my graduation date, I can honestly say that the North Dakota Space Grant Consortium made these past two years the best two years of my life. I had the best job I could have asked for – teaching young scientists that you don't have to be an astronaut to reach space and that anyone can love learning science. I have learned a skill that can only be learned through a hands-on approach, and Space Grant generously provided tools and precious time to make sure that the ballooning STEM outreach was a success.





Consortium Description

The Mission of the Ohio Space Grant Consortium (OSGC) is to advance the Nation’s capability in Science, Technology, Engineering, and Mathematics (STEM) leading to the continued development of a diverse workforce through NASA-related collaborations within Ohio’s network of scientists, researchers, engineers, and educators at Ohio colleges and universities, the Ohio Aerospace Institute, NASA Centers, the Air Force Research Laboratory, and industry. A key component of this activity is to attract and retain students in STEM disciplines with emphasis on increasing participation by women and underrepresented groups.



Summary of OSGC Programs

OSGC programs enhance opportunities for all Ohioans to participate in NASA STEM-related research, education, workforce, and public service programs. Key OSGC programs include:

- Scholarships (Junior, Senior, Community College)
- Pre-service Teacher Education Scholarships
- Graduate Fellowships
- Internship opportunities at NASA Centers and industry
- Student research grants for hands-on, student-led activities
- Student balloon satellite and rocket programs
- Student retention and curriculum enhancement grants
- Mini-grants to Ohio K-12 teachers for hands-on activities
- STEM teacher training and professional development programs for Ohio K-12 teachers
- Informal education activities that support STEM education



Lead Institution

Ohio Aerospace Institute

Affiliate Members

- Air Force Institute of Technology
- Case Western Reserve University
- Cedarville University
- Central State University
- Cleveland State University
- Miami University
- Ohio Northern University
- Ohio University
- The Ohio State University
- The University of Akron
- The University of Toledo
- University of Cincinnati
- University of Dayton
- Wilberforce University
- Wright State University

Participating Institutions

- Kent State University
- Marietta College
- Youngstown State University

Community Colleges

- Columbus State Community College
- Cuyahoga Community College
- Lakeland Community College
- Lorain County Community College
- Owens Community College
- Sinclair Community College
- Terra Community College

Government Liaisons

- NASA Glenn Research Center
- Air Force Research Laboratory

Education Outreach Partners

- Cincinnati Observatory Center
- Drake Planetarium & Science Center
- iSPACE, Inc.



NASA/Ohio Space Grant Consortium

Student Research

Radiation Recoil Effects on the Dynamical Evolution of Asteroids

Desireé Cotto-Figueroa, Doctoral 3, Ohio University

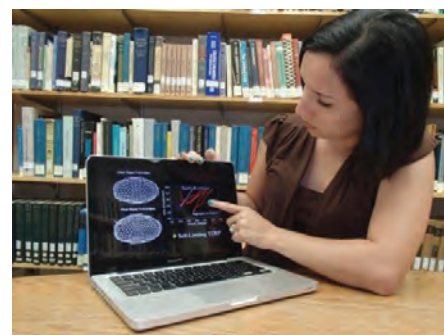


Biography

I have always shown a great interest in science and mathematics and by the time that I was in high school, I knew that astronomy was my passion. As an undergraduate student at the University of Puerto Rico, I was a NASA Puerto Rico Space Grant Consortium Fellow and conducted a research project about measurements of separation and position angle of binary stars. For the summer of 2005, I was selected for a Research Experiences for Undergraduates (REU) Program at the University of Hawaii to study the habitability of the 55 Cancri extrasolar planetary system. I graduated Cum Laude from the University of Puerto Rico in 2006 with a B.S. Degree in Applied Physics (Electronics). In 2008, I obtained an M.S. Degree in Physics from Ohio University with a thesis title "The Rotation Rate Distribution of Near-Earth Asteroids (NEAs)". I am currently a graduate student at Ohio University, and I will obtain my Ph.D. Degree this Fall of 2013 with a dissertation title "Radiation Recoil effects on the Dynamical Evolution of Asteroids". I was a NASA Jenkins Predoctoral Fellow from 2008 to 2011 and had the enlightening opportunity of working at the Jet Propulsion Laboratory to study radiation recoil effects on orbits of NEAs. Astronomy will always be a great passion for me, one that motivates me to continue studying and to give more of myself, not only at the academic level, but also on the professional level. I know that being a NASA Ohio Space Grant Consortium Fellow together with my efforts and determination will take me to my goal of obtaining my Ph.D. Degree. Starting Fall of 2013, I will be a post-doctoral researcher at Arizona State University. As a post-doctoral researcher I want to expand my knowledge and further develop my skills in order to accomplish my ultimate goal of being a professor and a research advisor.

Abstract

Radiation recoil forces are caused by the anisotropic emission of thermal photons from the surface of a rotating object that is heated by sunlight. The Yarkovsky effect is a radiation recoil force that results in a semimajor axis drift in the orbit that can cause main belt asteroids to be delivered to powerful resonances from which they could be transported to Earth-crossing orbits. A variation of the Yarkovsky effect, known as the YORP effect, is a net torque that causes a change of the spin rate and obliquity (i.e., the angle between the orbital plane and the spin axis of the object). The YORP effect should leave a distinctive signature, driving the spin axis of most asteroids to obliquity values of 0, 90 and 180 degrees. So far, there are only about 20 Near-Earth Asteroids (NEAs) for which a rotation pole has been determined. Instead of obtaining a direct measurement, the obliquity of an NEA can be inferred if the semimajor axis drift rate due to the Yarkovsky effect is known since from the linear heat diffusion theory for a spherical body, the semimajor axis drift rate varies linearly with cosine obliquity. I estimated the semimajor axis drift rates for a sample of 801 NEAs using the Jet Propulsion Laboratory Comet and Asteroid Precision Orbit Determination Package. Although there is a simple dependence between the semimajor axis drift rate and the obliquity, the true scenario is more complicated since for the great majority of NEAs, there is no information available about their physical characteristics. One of the goals of my dissertation is to develop a code that will explore a wide variety of models for the distribution of obliquities of the NEAs in order to identify the intrinsic obliquity distribution that is consistent with the semimajor axis drift rates obtained for the sample of 801 NEAs. If the distribution shows that the obliquities of the asteroids tend towards 0, 90 and 180 degrees, it would be supporting evidence for the significance of the YORP effect as the main physical process in the evolution of NEAs. This research will contribute to the understanding of radiation recoil forces, which are dominant physical processes in the evolution of NEAs. It will address the nature of the origin and evolution of NEAs and therefore to the origin and evolution of our Solar System since NEAs are the pieces left over from the formation of the inner planets.





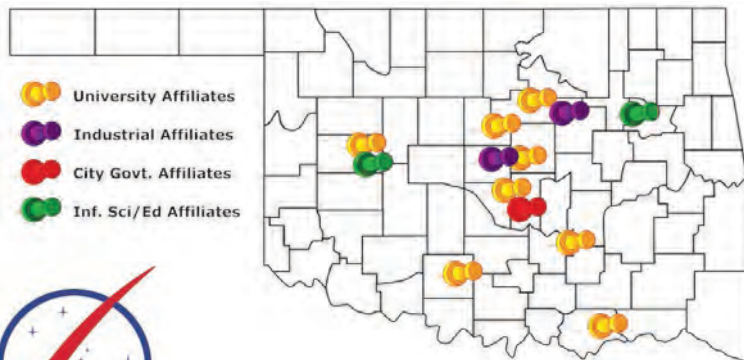
Oklahoma NASA Space Grant Consortium

Oklahoma Space Grant Consortium Mission

To create opportunities for Oklahomans to understand and participate in NASA's Mission by supporting programs in science, technology, engineering, mathematics, and other aeronautics and space-related disciplines throughout the state.

Oklahoma Space Grant Consortium Vision

To establish the Oklahoma Space Grant Consortium as a valuable State resource and catalyst for aeronautics and space-related research, education, and state economic and workforce development through a state-wide partnership of universities, state government, city government, industry, an informal aerospace education organization, and a space science museum.



Lead Institution

The University of Oklahoma

Charter Affiliates

Cameron University
Langston University
Oklahoma State University

Institutional Affiliates

East Central University
Southeastern Oklahoma State University
Southern Nazarene University
Southwestern Oklahoma State University

Academic Affiliates

Applications Engineering Program
Center for Spatial Analysis

Industrial Affiliates

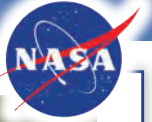
Frontier Electronic Systems Corporation
Science Applications International Corporation

City Government Affiliate

Norman Economic Development Coalition

Informal Science Education Affiliates

Stafford Air & Space Museum
STARBASE Oklahoma Inc.



OSGC: 25 Years of *IMPACT*

- Over 2,500 competitively awarded scholarships and fellowships to students in NASA-related subject areas
- Participant diversity of over 30% underrepresented groups
- Over 2,000 students per year receiving hands-on training in NASA-related STEM areas
- Over 300 pre/in-service teachers trained per year, through “Mission to Planet Earth” and STARBASE
- Over 55% of OSGC student participants and interns hired in NASA-related STEM fields.
- NASA-related research and technologies brought to small Oklahoma companies to make them more competitive
- Average of over 60 programs per year, resulting in high STEM retention rates
- 25 international aerospace design/build/fly awards resulting directly from OSGC programs:
 - ◊ 3 world aviation records: Federation Internationale Aeronautique (FAI), and National Aeronautic Association (NAA)
 - ◊ 24 student design competition awards
 - ◊ 1 land speed world record





Oregon NASA Space Grant Consortium

Affiliate Members

- Eastern Oregon University
La Grande
- Evergreen Aviation & Space Museum
McMinnville
- George Fox University
Newberg
- Lane Community College
Eugene
- Linn-Benton Community College
Albany
- Oregon Institute of Technology
Klamath Falls
- Oregon Museum of Science and Industry
Portland
- Oregon State University
Corvallis
- Pacific University
Forest Grove
- Portland Community College
Cascade Campus
- Portland Community College
Rock Creek Campus
- Portland Community College
Sylvania Campus
- Portland State University
Portland
- ScienceWorks Hands-On Museum
Ashland
- Southern Oregon University
Ashland
- The Museum at Warm Springs
Warm Springs
- University of Oregon
Eugene
- University of Portland
Portland
- Western Oregon University
Monmouth

In 1988, Congress established the National Space Grant College and Fellowship Program in an effort to:



OSGC - The Face of NASA in Oregon

- **Establish** a national network of universities with interest and capabilities in aeronautics, space, and related fields;
- **Develop** a strong science, technology, engineering, and mathematics (STEM) education base from elementary through university levels;
- **Encourage** cooperative programs among universities, aerospace industry, and federal, state, and local governments;
- **Encourage** interdisciplinary training, research, and public service programs related to aeronautics, space sciences, and technology;
- **Recruit** and train professionals, especially women and underrepresented minorities and persons with disabilities, for careers in aerospace related fields.

About OSGC

As one of 52 members of the National Space Grant College and Fellowship program, the Oregon NASA Space Grant Consortium (OSGC) strives to attain the goals and missions set forth by NASA regarding education, research, and public service. In support of these goals, OSGC has established strong collaborative affiliations with schools and universities, state and local government, and informal education programs throughout the state. OSGC maintains a diverse array of programs within this state network to Fostering Science, Technology, Engineering, Mathematics (STEM) and STEM Education within Oregon

OSGC Programs

- **Scholarships and Fellowships** - Merit-based and research opportunities for students with career goals in STEM, relating to the mission and vision of NASA
- **NASA Center Internships** - Students are competitively selected to participate in a hands-on, research-based, summer internship program or NASA Academy at a NASA center
- **Student Symposium** - OSGC funded students present their research projects at the annual student symposium
- **Student Research Awards Program** - Awards are made to student teams proposing hands-on STEM based research projects, particularly those leading to participation in national and international student competitions, relating back to the mission and vision of NASA.
- **Faculty Research Awards Program** - Grants are provided to faculty at OSGC institutions for scientific, aerospace related research that provides authentic hands-on research opportunities for students and/or develop materials for relevant STEM coursework in higher education.



Oregon NASA
Space Grant Consortium

Director: Jack Higginbotham, PhD
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Oregon State University
Corvallis, OR 97331-2103
Phone: 541-737-2414
Fax: 541-737-9946

Success Stories

<http://spacegrant.oregonstate.edu>
spacegrant@oregonstate.edu



Howard Hui, former Oregon State University student, received OSGC funding for the 2010 NASA Undergraduate Student Research Program (USRP) internship at the Jet Propulsion Lab in Pasadena, California. Additionally, Hui participated as a USRP intern at NASA's Goddard Space Flight Center in the fall of 2007 and spring of 2008. In the summer of 2008 he was part of the Student Internship Program at Goddard as well as the winner of the John Mather Nobel Scholarship. In the summer of 2009 Hui participated in the NASA Academy. All of these were in the Observational Cosmology Group. Howard is currently working towards his

"These experiences really gave me a chance to work on experiments that other places cannot provide, I have been able to learn and work with the best people in the field...The most important part is by spending so much time at NASA, it helped me to determine much more than just my future career plan. Working with my NASA mentors, I was able to see the life of a brilliant NASA scientist. I recognized that this life is exactly what I want."
— Howard Hui, former NASA intern

The Oregon State University Mars Rover Challenge Team, a student team sponsored by the OSGC, is a three-time winner of the University Rover Challenge, an annual competition organized by the Mars Society. In this competition, teams of university students build tele-operated rovers, which must complete sample return, construction, emergency navigation, and site survey tasks. Former team members have gone on to graduate programs, teaching positions, and industry jobs with Intel and SpaceX. Many former participants cite the Rover challenge as key in their educational career.

"Thanks to OSGC for your support, this project is truly producing a lot of quality engineering talent! Our Mars Rover Team has demonstrated an amazing desire to increase community awareness for Oregon State University and strive to win competitions. The Rover Challenge has been a fantastic learning experience for all of our team members and we're proud representatives of the OSU engineering program and the Oregon Space Grant Consortium."
— Ryan Albright, former team leader



A team of Jackson Middle School students, led by educator Jennifer Kelley, Portland State University faculty member Dr. Mark Weislogel, and OHSU's Dr. Erik Gouaux, flew an experiment on space shuttle Endeavor's final mission as part of the National Center for Earth and Space Science Education's (NCESE) Student Spaceflight Experiment Program (SSEP). The experiment funded in part by the Oregon Space Grant Consortium in collaboration with the Portland Public Schools and Portland State University, utilized space station NanoRack mini-lab space to study cancer cell proteins in microgravity. The student team members, whose friend has terminal brain cancer, hope that their research may lead to better treatment for the disease. Jennifer Kelley has plans to apply for NASA astronaut training with a goal of becoming an educator astronaut.

"This has been and continues to be an amazing, challenging, stressful, and intensely gratifying experience. The students on our team (and their parents) are really putting their all into the process. We have now partnered with Dr. Erik Gouaux at Oregon Health and Science University. His expertise aligns well with the girls' experiment... It's totally amazing, especially for somebody in middle school, to have a chance to conduct science in space." — Jennifer Kelley, Educator



PENNSYLVANIA SPACE GRANT CONSORTIUM

Connecting Pennsylvania Citizens to NASA Resources and Opportunities

Mission:

To expand opportunities for Pennsylvanians to learn about and participate in NASA's aeronautics and space programs by supporting and enhancing science, technology, engineering & math (STEM) education, research, and outreach programs.

LEAD INSTITUTION

The Pennsylvania State University

AFFILIATE MEMBERS

California University of Pennsylvania
Carnegie Mellon University
Cheyney University
Drexel University
Franklin & Marshall College
Gettysburg College
Lehigh University
Lincoln University
NASTAR Center
Penn State University – Abington
Susquehanna University
Temple University
University of Pittsburgh and Education Research Center
West Chester University

Consortium Description

The primary objectives of the Pennsylvania Space Grant Consortium are: (1) Develop and promote opportunities for students to participate in research and discovery. (2) Provide graduate and undergraduate training in NASA-related fields through the mechanism of fellowship and scholarship awards. (3) Support the development of interdisciplinary courses, curricula, and workshops, including introductory courses designed for undergraduate students not majoring in scientific or technological disciplines. (4) Model diversity in space grant leadership, programs, and activities; implement programs targeted at increasing the retention rate of students from underrepresented groups in science and engineering. (5) Provide information and programs to increase access to the excitement, knowledge, and technology from America's earth, air and space programs; establish PSGC as a viable state resource and catalyst for aerospace research, education, and economic development. (6) Cultivate a statewide network of partners from universities, industry, museums, science centers, state and local agencies to pursue aerospace research, education, and economic development goals. (7) Develop earth, air, and space programs to enhance public scientific literacy and to complement community needs.

Summary of PSGC Programs

PSGC programs expand opportunities for Pennsylvanians to learn about and participate in NASA's aeronautics and space programs by supporting and enhancing STEM education, research, and outreach programs. The various programs at our lead institution and at affiliate campuses are designed to parallel the individual strengths of those institutions, while complementing the PSGC strategic goals and considering the needs of the commonwealth.

Our programming emphasizes NASA-related undergraduate and graduate student research by support of fellowships, scholarships, and higher education programs. Diversity is always a consideration in programming as we strive to engage more students from minority and underrepresented populations in STEM fields. Fundamental PSGC programs include:

- NASA center internships
- Statewide undergraduate scholarships
- Graduate research fellowships
- Undergraduate hands-on research experiences
- University space programs laboratories
- Student-led high altitude balloon and rocketry projects
- Mini grants for early career faculty and academic researchers
- Professional development workshops for STEM educators
- Informal STEM education events and activities for K-12 and community involvement



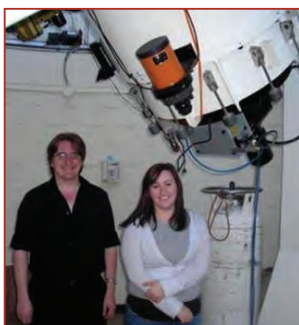
PSGC Programs

Undergraduate Research Programs

Hands-on research programs for undergraduate students are in place at many of the PGSC affiliate campuses, with prominent programs at Penn State, Penn State Abington, and West Chester University. These programs place students into research labs early in their undergraduate



career where they can work under the direction of faculty or graduate student mentors to gain practical lab practice in an authentic research setting. These programs increase interest and retention in STEM fields and help students advance into graduate programs.



Astronomy-specific research programs at Franklin & Marshall and Gettysburg colleges provide students with concentrated periods of high quality observing and hands-on astronomy-based projects at a professional astronomical observing site.

Student Space Hardware Laboratories

PSGC emphasizes support to hands-on engineering programs for students. These programs lend practical experiences to supplement classroom learning and contribute vastly to workforce development in STEM fields.

The space systems labs at Drexel, Penn State, and Temple universities started to cultivate future leaders in space technology. The labs prepare students to take leading roles after graduation, both in industry and as researchers. Lab projects allow students to design, fabricate, and integrate space systems using classroom knowledge to generate hands-on projects with other aerospace engineers and scientists.



Specific projects include a rocket payload that is launched with a rocket from Wallops Flight Facility during the Colorado Space Grant Consortium's annual RockSat program. Other hands-on engineering projects include high-altitude ballooning at Drexel and Gannon universities. These opportunities allow students to launch balloons up to an altitude of 95,000 feet to measure temperature and pressure, and track using ballooning GPS.

Student Research Highlight

Raven Hooper, Undergraduate Junior, Electrical and Computer Engineering, Temple University

This past year I started a robotics club, Competitive Robotics at Temple Engineering (C.R.A.T.E). The ultimate goal of this club is to start a Robocup team here at Temple University to compete in various competitions, such as VEX. Robotics has been an amazing experience that I hope we can continue to do it always.

I am very proud of my team because even with classes, they work hard and problem solve to the best of their abilities and just overall get things done. This summer C.R.A.T.E has purchased a humanoid robot using money given to us from PA Space Grant and the Alliance for Minority Participation programs. By doing this we hope to gain understanding of humanoid autonomous programming.

In addition to Robotics, I help with the Introduction to Engineering course at Temple. The course is completely hands-on focusing on designing, building and controlling hovercraft via iPads. Finally, I and a few members of the Lunabots team helped deaf teens learn how to program small autonomous robots at the Philadelphia School for the Deaf. We taught the students about problem solving, how to use sensors, photoresistors and how to program.





NASA/RHODE ISLAND SPACE GRANT CONSORTIUM

Consortium Description



The mission of the Rhode Island Space Grant (RISG) Consortium is: to encourage undergraduate and graduate students to explore NASA-related science research and engineering as careers; to use space-related science as a vehicle for enhancing scientific literacy among educators and their students in Rhode Island; and to provide seed grants for NASA-relevant research.

Summary of RISG Programs

Brown University has been the lead institution for RISG since 1991. Since that time, we have awarded more than 250 fellowships and scholarships. We are dedicated to promoting science, math, engineering, and technology at all levels (from K-12 to colleges and universities) through NASA's goals to explore and discover. We engage educators and the general public with the results of space exploration through special events, exhibits, and presentations. We partner with museums and industries in order to kindle interest and enthusiasm about NASA space exploration and research.

- Undergraduate Scholarships
- Graduate Fellowships
- Research Seed Grants
- Summer Research Internships
- Student Research/Travel Grants
- Innovative Course Development
- Museum/University Partnerships
- Educator Partnership Program
- Tougaloo/Brown Partnership

Lead Institution

- Brown University

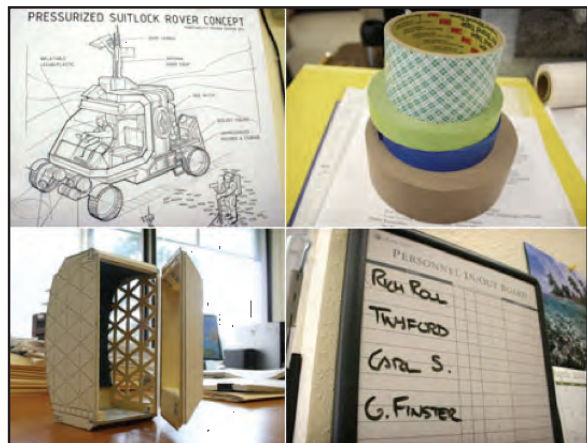


Affiliate Members

- Bryant University
- Community College of RI (CCRI)
- Graduate School of Oceanography (URI)
- Museum of Natural History (Providence)
- Providence College (PC)
- Rhode Island School of Design (RISD)
- Rhode Island College (RIC)
- Roger Williams University
- Salve Regina University
- University of Rhode Island (URI, Kingston)
- Wheaton College

Partners

- Krupowicz Planetarium (Middletown)
- Ladd Observatory
- NASA Educators Resource Center (RIC)
- Northeast Regional Planetary Data Center



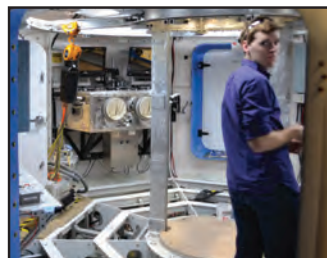


NASA/RHODE ISLAND SPACE GRANT CONSORTIUM

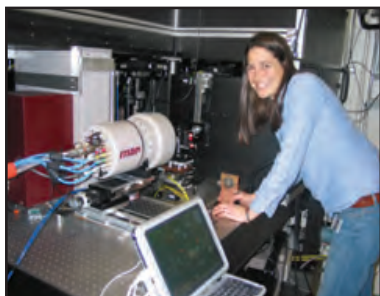
Past Fellows and Scholars



Dr. Stephon Alexander, 1998 RISG Fellow: As a graduate student in Physics at Brown University, Stephon assessed the role and interaction of topological artifacts (arising from particle-physics models) in the formation of large scale structures in the universe using recent results from NASA's deep space sensors. As a Space Grant Fellow, Stephon participated in our Educator Partnership program and is a truly gifted communicator as well as researcher. After previous faculty appointments at Penn State and Haverford College, he recently joined the faculty at Dartmouth as a chaired Professor (the E. E. Just 1907 Professorship). He continues his passion for teaching and increasing the number of minorities majoring in the sciences. His research focuses on theoretical cosmology, quantum gravity and particle physics. But he is also an accomplished musician (tenor saxophone). Stephon's experience in outreach programs at Brown still continues: he is a *National Geographic Emerging Explorer*.



Bryan Cloyd, 2010 and 2011 RISG Undergraduate Scholar: Bryan's first NASA experience was as a member of a RI Space Grant supported course offered through the Rhode Island School of Design (RISD) Industrial Design (ID) program. The 15 students in the course designed and built an entry for NASA's Great Moonbuggy Competition. During the January/February of 2010, he had his first experience actually working at NASA when he was selected as one of two interns from RISD's ID program to work at the HDC. While there he supported work on the Constellation program including the Altair Lunar Lander. He also helped prepare two generations of the Lunar Electric Rover for testing during the annual Desert Research and Technology Studies held later that year. Bryan graduated from RISD in June 2011 and is now working in the Habitability Design Center (HDC) at NASA Johnson Space Center.



Dr. Elizabeth Cottrell (Stevenson), 1996-1997 RISG Research Scholar: Liz focused on experimental and analytical petrology related to volcanic processes. She was an outstanding participant in our Teacher Partnership throughout Rhode Island, visiting schools and engaging both educators and their students. After Brown, she was awarded a Fulbright Fellowship to continue her studies in Paris. After completing her PhD at Columbia (Lamont Doherty Earth Observatory) in 2004, she continued her research at Columbia as a Post-doctoral Fellow. She is now Curator/Research Geologist and Director of the Global Volcanism Program (Department of Mineral Sciences), National Museum of Natural History, Smithsonian Institution, Washington D.C. By the way, she continues exciting young minds by participating in Smithsonian's "Nifty Fifty" (visiting middle schools and high schools to share in her love of science).



Dr. Jessica Meir, 1997 RISG Undergraduate Summer Scholar: Jessica worked on muscle-cell atrophy on NASA's Shuttle Program. She (and other students at Brown) designed an experiment for NASA's Reduced Gravity Flight Opportunity. This was just one of the many NASA opportunities in which she participated. After leaving Brown, she worked at the NASA Johnson Space Center where she supported scientists in the Human Research Facility. There she coordinated and supported human space flight experiments on both the Space Shuttle and the International Space Station. Returning to graduate school, she received her PhD in physiology and continued her research at Harvard. But her desire to follow her dream to experience space never died. Dr. Jessica Meir (past Rhode Island Space Grant Scholar) was just selected as one of 8 new NASA astronauts.

MAKING an IMPACT!

Lead Institution:
College of Charleston

Affiliates:
Benedict College
Claflin University
Clemson University
Coastal Carolina University
Francis Marion University
Furman University
Lander University
Medical University of SC
Presbyterian College
SC State University
The Citadel
University of SC
University of the Virgin Islands
Wofford College

Educational Partners:
Palmetto Scholars Academy
SC State Museum
Trident Technical College

Since 1995, SC has funded over 289 faculty, 640 students, and numerous educators!

South Carolina



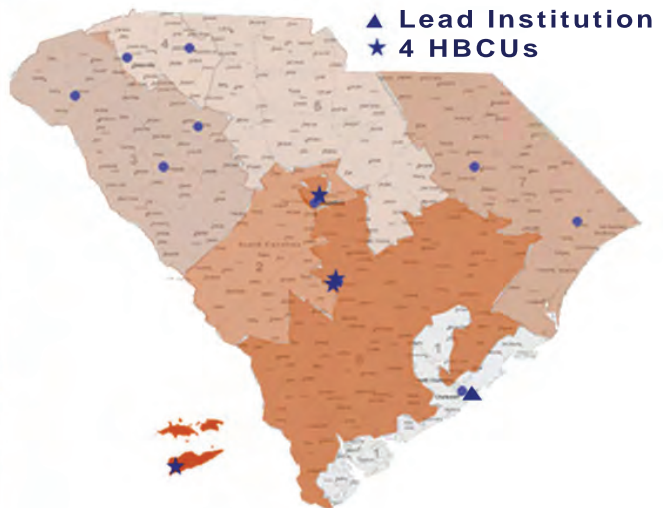
SPACE GRANT

<http://scspacegrant.cofc.edu/>

South Carolina Space Grant Consortium

The SC Space Grant Consortium is committed to excellence in student & faculty research and to promoting STEM education and expanding public engagement projects across the state.

The SCSGC strives to meet the nation's goals in science, technology, engineering, & math (STEM), the state's research and education priorities, as well as NASA's framework for education outcomes, while addressing the needs of the students, researchers, and general public of South Carolina.



▲ Lead Institution
★ 4 HBCUs

Summary of SCSGC Programs

We provide a range of programs to promote STEM in South Carolina.

- Palmetto Research Academy
- Undergraduate Fellowships
- Graduate Assistantships
- Earth & Marine Fellowship
- NASA Student Internships
- Minorities in STEM Fellowship
- Faculty Research and Curriculum Development
- STEM Educator Professional Development
- Public Outreach at Informal Education Institutions



SOUTH CAROLINA SPACE GRANT CONSORTIUM

MAKING AN IMPACT!



David Kutai Weiss | Brown University



David, a budding geology undergraduate, is unsure exactly the career direction he wants to pursue. He takes an introductory Planetary Geology course and a NASA mission design class at the College of Charleston. He gets excited about planetary science and decides to strive for the astronaut program. David applies and is accepted for a Goddard Space Flight Center internship where he investigates martian basalts. David presents his research at two national conferences. As a result of his growing knowledge and experiences, David is selected for the prestigious position as a field crew chief at the Mars Desert Research Station. After graduation, David participated in another internship at the Jet Propulsion Laboratory and then went on to Brown University for graduate school in planetary geosciences. The rungs of success on David's ladder were made possible through the SC Space Grant!

Missy Gaddy | Wofford College

Missy Gaddy, a junior at Wofford College, is pursuing a degree in computer science and mathematics, disciplines typically dominated by males. However, she believes in herself and applies for an internship at Goddard Space Flight Center, examining data from the Lunar Ejecta and Meteorites Experiment on Apollo 17. She presents this work at a conference winning second place in undergraduate research. She also competes on a programming team that solves 8 problems an hour before the contest is over, taking the win. The rungs of success on Missy's ladder were made possibly through the SC Space Grant!



Ryan Boodee | The Citadel



Ryan Boodée, a senior at the Citadel Military College, is double majoring in Applied Physics and Mathematics, a route that he believes will help him realize his dream of one day becoming a test pilot and eventually an astronaut. The summer following his freshman year, Ryan was selected for the Palmetto Research Academy, where he began developing the Atsa Suborbital Laboratory armrest telescope, which will be flown on the XCOR

Lynx Mark I. Ryan continues to work on this project—developing it further and presenting his results at numerous conventions, including one at Kennedy Space Center. The following summer, Ryan is selected for a NASA Academy internship, at Ames Research Center, where he conducts a feasibility study of a habitation trip to Mars (with Dr. Pete Worden) and serves as the structures subsystem team leader for a project in which a water/soil sampling probe was designed for extreme aqueous environments. After his incredible experience with the NASA Academy, Ryan chooses to spend another summer as an Operations Manager for the MSFC Propulsion Academy, both in hopes of giving back to the NASA Academy program, and learning more about the field of propulsion, which he intends to study in greater detail in graduate school. The rungs of success on Ryan's ladder were made possible through the SC Space Grant!

NASA South Dakota Space Grant Consortium



Inspiring the next generation of explorers

Consortium Description

The South Dakota Space Grant Consortium (SDSGC) seeks to increase the number of students in STEM education and careers through *coordinated programs* in higher education, precollege education, informal education, and public service. A major priority is to increase diversity in STEM fields by recruiting female students and students from underrepresented groups. The consortium’s 18-member network includes public, private, and tribal universities; informal science centers; industry partners; and state and federal government agencies such as the Sanford Underground Research Facility and the United States Geological Survey’s EROS Data Center.

Summary of SDSGC Programs

As an active participant in the national network of Space Grant consortia, SDSGC plays a critical role in implementing NASA’s Office of Education programmatic priorities at the state level. This integrated structure—*national network and state focus*—results in strategic partnerships to address critical state and national priorities in STEM competitiveness.

Major SDSGC program areas include:

- Undergraduate and graduate fellowships for STEM students
- Support for NASA and aerospace internships
- College robotics and interdisciplinary engineering design teams
- Seed grants for innovative research and education projects
- K-12 teacher grants and student opportunities
- Precollege robotics teams

NASA investments in these areas are highly leveraged, with non-federal matching at a rate of at least 70% of NASA funds. Through follow-on grants and competitive NASA awards, SDSGC and the closely related SD NASA EPSCoR program have delivered nearly a 10-to-1 return on NASA’s base dollar investments.

Lead Institution:

South Dakota School of Mines & Technology

Affiliate Organizations:

Higher Education

- South Dakota State University
- University of South Dakota
- Black Hills State University
- Dakota State University
- Northern State University
- Augustana College
- Oglala Lakota College
- Sinte Gleska University
- Lake Area Technical Institute

Informal Education

- The Journey Museum
- South Dakota Discovery Center
- Badlands Observatory
- Black Hills Astronomical Society

State and Federal Research Centers

- Sanford Underground Research Facility
- USGS Center for Earth Resources Observation & Science (EROS)

Industry

- Raven Industries/Aerostar International
- RESPEC





NASA South Dakota Space Grant Consortium



Inspiring the next generation of explorers

Student Research and Internships

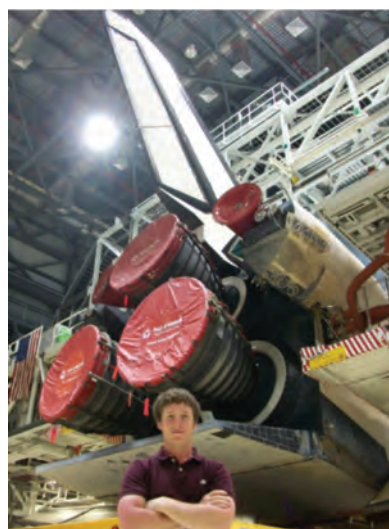
Lilly Jones—Oglala Lakota College

Lilly Jones is a 2013 graduate in Earth Science from Tribal College affiliate Oglala Lakota College. Lilly received multiple SDSGC educational fellowships during her undergraduate career and in FY2012 was awarded a research stipend for her project titled “A Resource Inventory of Selected Sites Adjacent to the White Clay Fault in Southwest South Dakota,” located in the badlands of the Pine Ridge Indian Reservation. Lilly was one of only 12 students statewide selected to present her research to legislators at the 2013 Student Research Poster Session at the State Capitol Rotunda in February 2013. In March, Lilly was selected to receive a prestigious National Science Foundation Graduate Research Fellowship which will be renewable for up to three years. She will begin her MS program in Geology and Geological Engineering at South Dakota School of Mines & Technology in fall 2013 and eventually plans to earn her PhD in Earth and planetary sciences. Her research interests include stratigraphy, sedimentary geology, surficial processes, and the geology of Mars. Her goal is to become a planetary scientist and to work at NASA or a university conducting research on geologic data from NASA missions, for example, interpreting data from the Mars rovers in terms of sedimentary processes and past climate.



Travis Davis—South Dakota School of Mines & Technology

Travis Davis is a Mechanical Engineering senior at SDSM&T, raised on a ranch outside of Camp Crook, SD (population 100). After completing internships at John Deere and Caterpillar, he learned of NASA’s



Undergraduate Student Research Program, and in 2011 was accepted to work on cryogenic propellant storage technology at Marshall Space Flight Center. Davis said, “*If we can hone this technology ... it will change the way we travel into and through space. The effect that this research could have on space travel and the world is astounding.*” In 2012, Travis was accepted into the MSFC co-op program in the Valves, Actuators, and Ducts department. During his most recent co-op rotation, Travis helped to disassemble and refurbish an Apollo-era Saturn V F-1 engine in the center’s Propulsion Research Development Laboratory. During hot-firing of the engine’s gas generator, the team was able to record sensitive measurements that were not possible during the 1960s. These tests, and other industry research designed to mitigate risks, will enable NASA to build the most powerful and affordable rocket ever launched.

Tennessee Space Grant Consortium

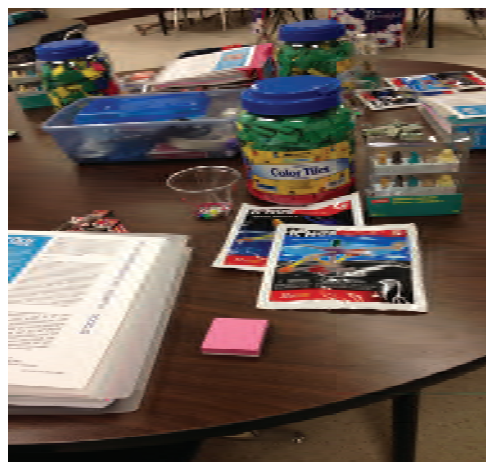
Austin Peay State University – Columbia State Community College – East Tennessee State University – Fisk University – Middle Tennessee State University – Oak Ridge Institute for Science and Education – The Renaissance Center – Rhodes College – Tennessee Education Association – Tennessee State University – Tennessee Technological University – The University of Tennessee at Chattanooga – The University of Tennessee at Knoxville – The University of Tennessee Space Institute – Vanderbilt University



NASA-ATK Student Launch Initiative 2012-13 Championship Team from Vanderbilt University



The Christian Brothers University 2013 Moonbuggy team in action



Preservice teachers at the University of Tennessee at Chattanooga received a binder of activities and color tiles, at the Color Tiles professional development workshop, Summer 2013



The new planetarium at the University of Tennessee at Knoxville has a 24-foot diameter dome and reclining seats for 34. Paul Lewis our Planetary Geosciences Institute Space Outreach Guru, presents at our official opening in April, 2013



Tennessee Space Grant Consortium

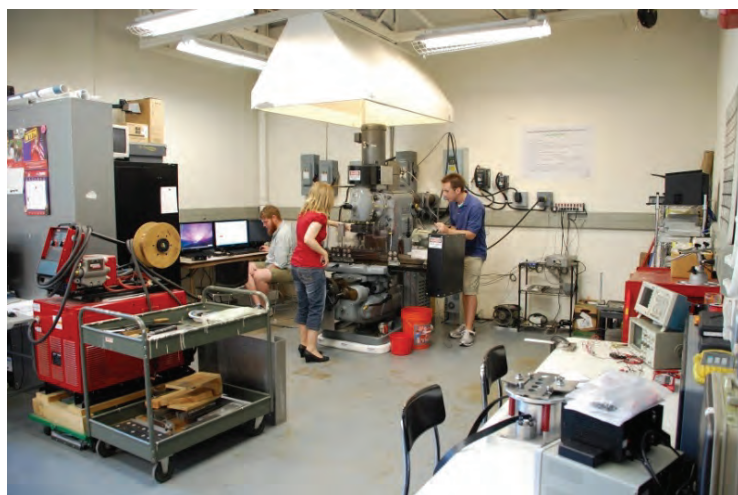
Austin Peay State University – Columbia State Community College – East Tennessee State University – Fisk University – Middle Tennessee State University – Oak Ridge Institute for Science and Education – The Renaissance Center – Rhodes College – Tennessee Education Association – Tennessee State University – Tennessee Technological University – The University of Tennessee at Chattanooga – The University of Tennessee at Knoxville – The University of Tennessee Space Institute – Vanderbilt University

Tennessee
Space Grant
Consortium

Friction Stir Welding

Student research by Chase Cox, Ph.D. student at Vanderbilt University

Friction Stir Welding is a solid-state welding technique patented by TWI in 1991. Its use is becoming more and more prevalent in aerospace, rail, automotive, and naval applications. Funding provided by the Tennessee Space Grant Consortium (TSGC) has allowed members of the Vanderbilt Welding Automation Laboratory to develop robust control systems that are capable of detecting undesirable flaws within the weld, monitor tool wear and react to dynamic changes in the process, among other things. Additional research supported by TSGC includes characterizing tool wear, dissimilar metal welding, computational fluid dynamic modeling of FSW and the development of technology for actively monitoring the FSW process for control and quality applications. In this presentation, an overview of the FSW process will be presented, with an in-depth look at our efforts in aerospace welding techniques to advance FSW as a rivet replacement technology.





CONSORTIUM DESCRIPTION

Part of NASA's National Space Grant College and Fellowship Program, which is a network of 52 state-based consortium including Puerto Rico and District of Columbia. Texas Space Grant Consortium (TSGC) is a group of 51 organizations which include universities, industrial organizations, non-profit organizations, and government agencies within Texas. Our mission is to vigorously educate, inspire and motivate students at all levels to pursue careers in science, technology, engineering and mathematics (STEM); to assist in the professional development of faculty members and researchers in pursuits aligned with NASA's mission; and to engage students and the general public in sharing and shaping the experience of exploration and discovery through innovating programs.

TSGC engages the state's brightest, most creative and most innovative students, engineers, scientists and educators in programs aimed at providing NASA and high tech industries with a vital and diverse technical workforce.



VISION

To enable the people of Texas, at all points in their lives and educational careers, to be inspired by, and participate in, the exploration of the great unknown of outer space.

SUMMARY OF TSGC PROGRAMS

- Graduate Fellowships
- Undergraduate Scholarships and Educator Scholarships
- TSGC Student Design Challenge Program
- NASA Academy Internships
- Liftoff Summer Institute Teacher Workshop
- Hands on STEM programs for K-12 Educators, Students and General Public
- Research infrastructure to foster and develop partnerships between Academia, Industry and NASA

MEMBERS

Four Year University Affiliates

Angelo State University, Baylor University, Lamar University, Prairie View A&M University, Rice University, Southern Methodist University, Sul Ross State University, Tarleton State University, Texas A&M University, Texas A&M University Commerce, Texas A&M University Corpus Christi, Texas A&M International University, Texas A&M University Kingsville, Texas Christian University, Texas Southern University, Texas State University - San Marcos, Texas Tech University, Trinity University, University of Dallas, University of Houston, University of Houston Downtown, University of Houston Clear Lake, University of North Texas, University of Texas Pan American, University of Texas at Arlington, University of Texas at Austin, University of Texas at Dallas, University of Texas El Paso, UT Health Science Center Houston, UT Health Science Center San Antonio, UT Medical Branch Galveston, University of Texas San Antonio, UT Southwestern Medical Center, University of Texas at Tyler

Community College Affiliates

San Jacinto College, Houston Community College, Austin Community College, El Paso Community College, McLennan Community College

Industry / State / Non-profit Affiliates

Austin Planetarium, Bob Bullock State History Museum, Don Harrington Discovery Center, Lockheed Martin, Office of the Governor, Rio Grande Valley Science Association, Southwest Research Institute, TX Higher Education Coordinating Board, United Space Alliance, University Space Research Association, Girlstart, Texas Medical Center

www.tsgc.utexas.edu





Buried Craters in Utopia Planitia Basin Region, Mars

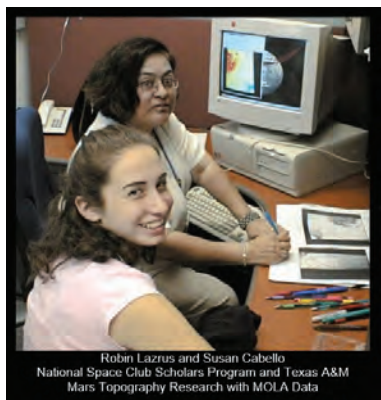
Dr. Herbert V. Frey
Principal Investigator

Gregoria Susana Cabello
Research Assistant

ABSTRACT

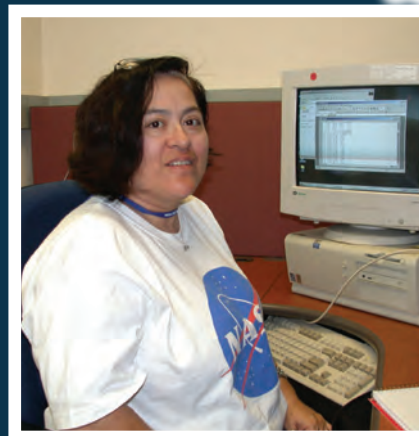
Using high-resolution polygon data from the Mars Orbiter Laser Altimeter (MOLA), located on the Mars Global Surveyor (MGS), the search for well-preserved impact craters, 15 –100 km in diameter, is researched in order to appreciate the concept of age determining processes on the Utopia Planitia Basin Region on Mars. MOLA is false-color topographic projections taken from different angles. The vertical accuracy of these projections is approximately > 5m. These maps have a resolution of up to 300 dots per inch. The area researched for the buried impact craters is between 0° and 80° N latitude belts and 180° to 300° W longitude. By using the MOLA polygon data and stretching the topographic shaded relief maps we can begin to visualize buried craters that may be very well preserved in some areas. In other areas we uncover only the remnant walls of an ancient crater, but remarkably still identifiable. These are called quasi-circular depressions (QCD's). A comparison to the 1983 Viking Lander maps, prepared and printed by the United States Geological Survey (USGS), is the tool used to compare visible craters with those not so visible. This study will determine the difference in the relief, elevations, and slope area of the Basin. This will provide us with better information on the crater bombardment era of Mars.

If we can determine the age of Mars, we can come closer to the origins of our own planet. We are missing a crucial billion years or so of our own geological history. We want to find this timeline on Mars. We want to locate any evidence that our origins had the same beginnings. We can easily see and measure the Southern cratered area of Mars. On the other hand, the Northern lowland of Mars is just leaking out its secrets. Finding



Robin Lazrus and Susan Cabello
National Space Club Scholars Program and Texas A&M
Mars Topography Research with MOLA Data

these buried craters can be extremely important to determine the aging process and formation of this Martian terrain. From aerial views, this region seems to be fairly flat and even, but upon closer examination, Mars reveals its past history. The scars of early planetary development are evident under the layers of lava flows and debris fields.



Susana Cabello STUDENT SPOTLIGHT

Susana Cabello is a high school teacher working at Martin High School, teaching Biology to ninth grade students, and also works for NASA Education and Outreach on a part-time basis. She applied and has been accepted to attend the International Space University located in France. She is waiting for a fellowship to sponsor her so that she may attend full time and receive her Master's in Science in Space Sciences.

During her undergraduate years at Texas A&M University - Kingsville, she applied and was accepted as the first student from TAMUK to attend the NASA Academy in the summer of 2004. She brought back to TAMUK her research experience in a professional poster session when she assisted Dr. Herbert Frey at Goddard Space Flight Center, Maryland in locating and identifying over one thousand buried craters in the Mars Utopia Planitia Basin. She graduated Summa cum laude from Texas A&M University - Kingsville in May 2005 with a Bachelor's in Science in Geology and a minor in Biology, and received her Master's Degree in Forensic Science from National University in La Jolla, California. Her Masters' thesis was "Forensic Science and the National Aeronautic and Space Administration."



NASA/Utah Space Grant Consortium

Consortium Description

The Utah NASA Space Grant Consortium has formulated its vision, mission, goals, and objectives to be consistent with those of NASA and its Office of Education. The Goals of the Consortium are: (1) To demonstrably contribute to the development of the STEM Workforce with programs, projects and activities that are in direct alignment with NASA's stated education strategic goals, missions and with her defined outcomes, objectives and PART measures; (2) To attract and retain students and teachers in the STEM disciplines who have a solid understanding of the subject material; (3) Conduct an Informal Education program to form strategic partnerships and linkages between STEM formal and informal providers leading to an expansion of the nation's future STEM workforce through awareness of the mission of NASA and the promotion of STEM literacy. Our objectives and activities include the National Space Grant program emphases of: diversity, competitiveness, NASA ties, industry relations, and state government involvement.

Summary of UNSGC Programs

The Utah NASA Space Grant Consortium enhances opportunities for those within the State of Utah and surrounding regions to participate in NASA STEM-related research, enhance education in STEM fields and careers, and to advance science, technology, engineering, and mathematics for the next generation. The key elements of the UNSGC program consist of the following:

- Graduate research fellowships
- Undergraduate research/education scholarships
- Internship opportunities at NASA Centers and Utah industrial partners
- Faculty research seed funding minigrants
- Curriculum enhancement minigrants
- Student research opportunities for hands-on, student-led programs and competitions
- Balloon satellite, rocket, bioengineering, and material science programs
- K-12 Teacher workshops with hands-on NASA-related classroom enhancement activities
- Informal education programs that enhance STEM education

LEAD INSTITUTION:

University of Utah

AFFILIATE MEMBERS:

Education & Research Universities

University of Utah
Brigham Young University
Utah State University

Education Institutions

Dixie State College
Salt Lake Community College
Snow College
Southern Utah University
Utah College of Applied Technology
Utah Valley University
Weber State University
Westminster College

Government Centers

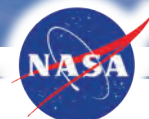
Idaho National Laboratory
Space Dynamics Laboratory
Hill Air Force Base

Industry

ATK Aerospace Group

Outreach Institutions

Clark Planetarium
Hill Aerospace Museum
North American Native Research & Education Foundation
The Leonardo



NASA/Utah Space Grant Consortium



Student Research

Leda Sox, Utah State University
PhD student, Physics

Ground-Based Observations with a Rayleigh-Mie-Raman Lidar from 15-120 km



Abstract

Rayleigh lidar systems have historically made ground-based observations of the upper atmosphere (stratosphere and mesosphere) from 35-90 km. This technology has helped fill the data collection gap between the troposphere and space. Recently, the Rayleigh lidar group at the Atmospheric Lidar Observatory on the campus of Utah State University (42° N, 112° W) upgraded the original lidar system in order to extend the measurement range for neutral densities and temperatures to higher altitudes and has increased the upper limit, so far, from 90 to 110 km. Next, this group will extend the lower altitude limit downward to 15 km.

This will enable the group to connect densities, temperatures, and their fluctuations in the mesosphere and lower thermosphere to the drivers in the lower portions of the atmosphere. Extending measurements downward will lead to signals, not only from Rayleigh scatter off of small particles (N_2 and O_2), but also from Mie scatter off of much larger particles (aerosols). In order to separate the Rayleigh and Mie signals, we will take advantage of the system's greater sensitivity to measure Raman scatter from N_2 , between 15 and 35 km, thus making the system a Rayleigh-Mie-Raman (RMR) lidar. The group can then apply the Klett Inversion algorithm to separate these signals in the data reduction. Such an extended altitude range will enable observations of atmospheric processes and phenomena, such as disturbances, waves and sudden stratospheric warmings, which can ripple up from the ground throughout the atmosphere. This range will also enable an absolute calibration of densities with data from radiosondes and assimilative models like NCEP.

The absolute calibration of atmospheric densities can provide a starting point for neutral models of the thermosphere, which are often used to predict satellite drag. In addition, the RMR lidar extended altitude range will provide significant overlap with satellite remote sensing measurements, which will help with calibration and validation efforts and in the extension of satellite measurements towards the ground. The RMR lidar will provide complementary measurements to those made by satellites by providing data that can measure the time evolution of atmospheric processes in one location, while satellite instrumentation gives global measurements of atmospheric processes.

The Utah Space Grant Consortium awards an average of 20 graduate student fellowships each academic year across all of the STEM disciplines. We also award an average of 15 undergraduate scholarships and 4 student internships each year.





CONSORTIUM DESCRIPTION

The primary objectives of the Vermont Space Grant Consortium (VtSGC) is to establish an infrastructure of colleges and universities within fields related to the interests of NASA, aeronautics, space, and aerospace related fields; to encourage cooperation among academics, aerospace industry, and government in our state. VtSGC strives to encourage interdisciplinary training, develop competitive research, and affiliate public outreach programs to enhance the awareness of aerospace related educational and research opportunities and to recruit and train professionals, including women and under represented minorities, for careers in education and aerospace; and to promote a strong science, math, engineering, and technology (STEM) educational base through university. These objectives are accomplished through faculty and graduate fellowships and undergraduate scholarships, VtSGC Aviation Technology scholarships, VtSGC Native American scholarships, internships and teacher training.

The Vermont NASA EPSCoR research projects are closely related to NASA's strategic enterprises in Aerospace Technology, Biological and Physical Research, Earth Science, Human Exploration & Development of Space, and Space Science.

Summary of VtSGC Programs

- Graduate research and fellowships
- Faculty research and curriculum enhancement grants
- Summer internships Graduate at NASA Centers, VT State industry, and VT institutions
- Mentored student research programs

Lead Institution:

University of Vermont

Affiliates

- Saint Michael's College**
- Vermont Technical College**
- Norwich University**
- Johnson State College**
- BTC/Aviation Technology School**
- Vermont Mathematics Coalition**
- Vermont Mathematics Initiative**
- VT Governor's Advisory Commission on Native Affairs**
- Triangle Metal Fabrication**
- Fairbanks Museum & Planetarium**
- LORD Microstrain Inc.**
- VT Aerospace and Aviation Association - State of VT**

Strategic Partners

- Archimedes Aerospace LLC**
- Montshire Museum**

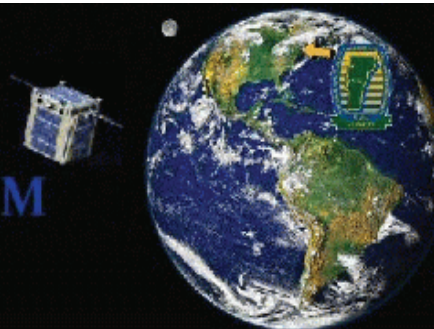
Partnerships

- VT NASA Explorer Schools**
- VT ACE Camp**
- VT Flight Academy**





VERMONT SPACE GRANT CONSORTIUM and NASA EPSCoR



A Discrete Multiphase Flow Approach to Monopropellant Based Micropropulsion

M. Ryan McDevitt, University of Vermont

The next generation of space missions will rely on miniaturized satellites (nanosats) to enable a range of scientific, commercial and defense missions that are currently cost prohibitive or not feasible. Constellations of nanosats can operate in a distributed network to perform missions comparable to or exceeding those for a larger satellite. To enable the most interesting and useful missions, however, nanosats must be able to maneuver in Low Earth Orbit. Micro-thrusters must be capable of satisfying very small thrust and impulse-bit requirements for orbital maneuvers with these small spacecraft. Due to a range of scaling issues, the development of micro-propulsion systems is more complicated than simply reducing the size of traditional thruster systems. This is an area of ongoing research in the aerospace community. At the University of Vermont, I have gotten the opportunity to work on the development of a hydrogen peroxide MEMS-based monopropellant micro-thruster.

One aspect of my research has been on the experimental and numerical design of a discrete micro-scale fuel injection system. In this system, an inert gas is introduced into the fuel stream to produce monodisperse slugs of fuel interdispersed with the gas to reduce the effective mass flow rate of the fuel. In experiments and computer simulations, we have found that this fuel injection system is capable of significantly reducing thrust when compared to traditional systems. This reduction in thrust is critical for developing a micropropulsion system that meets the minimum thrust level requirements.



Another focus of my research has been on the modeling of the catalytic chamber, where the monopropellant is decomposed. On the macro-scale, turbulence will cause the aqueous catalyst to promote the monopropellant to mix, but at the micro-scale the flow is laminar and so we have to use other methods of mixing. One technique that I am pursuing is the leveraging of flow phenomena unique to the micro-scale to achieve enhanced mixing in liquid fuel droplets when a gas is injected into the catalytic chamber. This technique allows for a dramatic reduction in mixing length required for the catalytic chamber, which will help in fitting the micro-thrusters onto the tight space requirement of a nanosat.

Ryan McDevitt is currently a Ph.D candidate in Mechanical Engineering at the University of Vermont. He received the M.S. degree in Mechanical Engineering from the University of Vermont in 2011, and the B.S. degree in Mechanical Engineering from Worcester Polytechnic Institute in 2003.



VIRGINIA SPACE GRANT CONSORTIUM



The Virginia Space Grant Consortium (VSGC) serves as a catalyst for the enhancement of STEM and aerospace-related education, workforce development, and research in the Commonwealth to foster an improved quality of life in Virginia. The Virginia Space Grant Consortium acts as an umbrella organization, coordinating and developing quality STEM high technology, educational, workforce development and research efforts throughout the Commonwealth.

Each seed Space Grant dollar in Virginia has been leveraged by more than \$5 of other funding in recent years. VSGC has worked with over 400 non-member program partners from private and public sectors.

VSGC programs include:

- Undergraduate Research Scholarships
- Graduate Research Fellowships
- Internships at NASA Centers and Industry
- Student-Led Flight Projects Including Cubesats, High-Altitude Balloon Launches, Airborne and Rocket Programs
- Faculty Research and Curriculum Enhancement Support
- Pre-College Student Programs
 - Online Courses for Credit
 - Summer Academies Hosted by NASA Centers and Higher Education Partners
 - STEM Exploratory Saturday Programs
- Pre-college Teacher Professional Development in STEM and Using NASA Resources
- Geospatial Technology Professional Development for Precollege and Higher Education Faculty
- Informal Education and Public Outreach in STEM

VSGC strives to increase diversity in the STEM pipeline through participation of underrepresented minorities, females, and people with disabilities.

MEMBERS:

- College of William and Mary
- Hampton University
- Old Dominion University
- University of Virginia
- Virginia Tech
- NASA Langley Research Center
- NASA Goddard Space Flight Center's Wallops Flight Facility
- State Council of Higher Education for Virginia
- Virginia Community College System
- Virginia Department of Education
- MathScience Innovation Center
- Science Museum of Virginia
- Virginia Air and Space Center
- Center for Innovative Technology





VSGC IMPACTS AND OUTCOMES

-More than \$5.6M in scholarship and fellowship funding to 1,358 students attending universities and community colleges in Virginia. More than \$4.9M of this funding directly supports STEM and aerospace-related research.

-VSGC has placed more than 3,900 students in paid internships with NASA, industry, or other federal labs including through the Commonwealth STEM Industry Internship Program (CSIIP) and the Langley Aerospace Research Student Scholars (LARSS) Program. Both CSIIP and LARSS are managed by VSGC.

-92% of all VSGC-supported higher ed students are either still enrolled in STEM majors or employed in STEM careers.

-STEM Exploratory Saturdays and STEM Academies have impacted more than 3,000 middle school students and informed more than 1,400 parents about STEM and college preparation.

-More than \$200,000 in scholarships to students attending Virginia's community colleges.

-New Investigator Program has provided \$180,000 in seed funding to support early career faculty to conduct STEM research of interest to NASA.

-Many student-led student flight projects including high altitude ballooning, cubesat, airborne and rocketry programs.

-Support for student design classes and projects.

-VSGC manages a national design competition for the FAA seeking innovative solutions to air transportation problems.

-Virginia Aerospace Science and Technology Scholars (VASTS) has engaged nearly 2,000 high school juniors statewide, at no cost to the students, in an online course and Summer Academy programs offering college credit. Ninety-five percent reported pursuing college degrees in STEM disciplines.

-Building Leaders for Advancing Science and Technology (BLAST), a free residential program, engages 160 middle school students each year from under served regions of Virginia in innovative hands-on experiences at member universities.

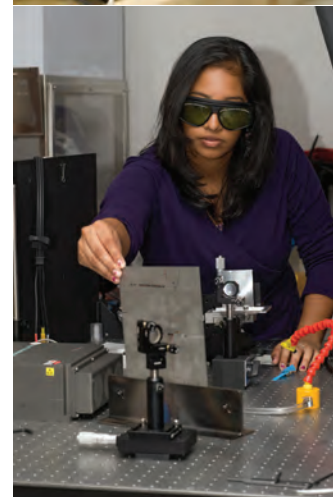
-Virginia Space Coast Scholars inspires at least 140 high school sophomores through an online STEM learning experience and Summer Academy at NASA Wallops.

-VSGC provides national leadership in Global Climate Change Education through NASA's Innovation in Climate Change Education (NICE), also in partnership with NSF and NOAA.

-VSGC leads a regional NSF-funded project in partnership with Virginia's community colleges to support geospatial technology faculty and teacher professional development.

-Teacher professional development in effective teaching of STEM has been provided to more than 30,000 K-12 educators.

-Dozens of informal education programs with museum, non-profit, and media partners have impacted thousands of participants.



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Lead Institution

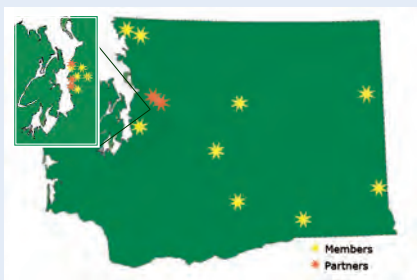
✦ University of Washington

Members

- ✦ Central Washington University
- ✦ Heritage University
- ✦ Museum of Flight
- ✦ North Central Educational Service District
- ✦ Northwest Indian College
- ✦ Pacific Science Center
- ✦ Seattle Central Community College
- ✦ Seattle University
- ✦ University of Puget Sound
- ✦ Washington State University
- ✦ Western Washington University
- ✦ Whitman College
- ✦ Whitworth University

Partners

- ✦ Aerojet
- ✦ Eagle Harbor Technologies
- ✦ Tethers Unlimited Inc.
- ✦ Woodruff Scientific Inc.
- ✦ Everett Community College
- ✦ North Seattle Community College



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 Fax: (206) 543-0179
 E-mail: nasa@uw.edu



www.waspacegrant.org



Consortium Description

Since 1989, Washington NASA Space Grant Consortium (WSGC) has worked to increase the number of Washington state residents pursuing careers in the STEM fields — science, technology, engineering and math.

Washington currently ranks second among 10 technology-dependent peer states in the intensity of its scientific and engineering workforce. The Boeing Company, Aerojet, Microsoft, Google and hundreds more companies throughout the state need highly qualified STEM employees. For this reason, WSGC programs aim to strengthen our state's entire STEM education pipeline through fellowships and scholarships, research opportunities, new curricula, K-12 teacher training, and informal public education programs aimed at sharing the excitement and knowledge gained from NASA's missions.

Summary of WSGC Programs

WSGC programs provide a foundation for building bright futures for the next generation of scientists and engineers, strengthening the STEM workforce in our state and at NASA. These programs include:

- Undergraduate research awards and scholarships
- Graduate fellowships
- Summer internships at NASA centers and in private industry
- Research experiences for pre-service teachers
- Support for student teams in rocketry competitions and other NASA-related events
- Curriculum and course development
- Standards-based K-12 teacher training in STEM topics and hands-on activities for students
- WSGC-partnered events in schools and community centers



Celebrating 25 years of Student Excellence



*Sarah Harvey, Class of 2014
University of Washington*

Sarah Harvey began research on RNA silencing in Arabidopsis plants before entering her freshman year, thanks to the Space Grant Summer Undergraduate Research Program.

The astronomy and physics major recently completed her second summer interning in The Boeing Company's Applied Physics Laboratory. Her experience qualifying materials and solar cells, using the Boeing particle accelerators and simulators, enhanced her knowledge of experimental radiation techniques, and of the necessity and mechanics of space radiation research before a space mission can proceed.

For Sarah, each research experience builds on the one before it. On campus, she researches experimental fuels for pulsed plasma thrusters, and is part of a rocket team testing whether plasma thrusters could work at high altitudes and eventually be adapted for space applications.

*Hakim Weatherspoon, Class of 1999
University of Washington*

As a Space Grant scholar, Hakim Weatherspoon was able to combine his passion for academics and athletics, fulfilling both of his childhood dreams: playing on the Husky football team at the University of Washington and solving complex computer engineering problems.



A Rhodes Scholarship finalist, he received his doctorate from the University of California Berkeley, where he was an Intel Master's and PhD Fellow. Today he's an assistant professor and leads a research group with six graduate and undergraduate researchers. A recipient of the NSF CAREER award and the NSF Future Internet Architecture award, he was also the co-editor and author of *Future Directions in Distributed Computing*.

His current work focuses on critical to cloud computing, including distributed, network, peer-to-peer, and fault tolerant systems, with an additional focus on data storage, file systems, and system integrity. In 2013, he served as co-chair for the ACM Symposium on Cloud Computing.



Consortium Description

The NASA West Virginia Space Grant Consortium (WVSGC) is a NASA sponsored organization with the mission of enhancing educational programs and research in the fields of Science, Technology, Engineering and Math (STEM) in the state of West Virginia. An important goal of WVSGC is to capture, channel, and enhance the activities of the current and potential scientists and engineers through the Consortium’s affiliate members network. The Consortium has attained a prominent presence in the state of West Virginia by providing exciting opportunities for students, college faculty and K-12 science teachers, specifically women and underrepresented minorities, through research programs, fellowship, scholarship and summer internship opportunities with NASA and high tech industries in WV. WVSGC is governed by a Board of Directors consisting of one member from each affiliate. The Board meets twice a year to set policies, make decisions about programs, annual competition rules, and budgetary issues.

Consortium Programs

Programs offered by WV Space Grant Consortium are as follows:

- Undergraduate and Graduate Research Fellowship
- Summer Internships with NASA and high tech industries
- Research Initiation Grants
- College Course Development
- Joint University–Industry Research
- K–12 Professional and Curriculum Development
- Extension and Public Outreach

Lead Institution:

West Virginia University

Academic Affiliates:

- Bethany College
- Bluefield State College
- Fairmont State University
- Glenville State College
- Marshall University
- Shepherd University
- West Liberty University
- West Virginia State University
- WVU Institute of Technology
- West Virginia Wesleyan College
- Wheeling Jesuit University

Other Affiliates:

- NASA IV & V Program
- NRAO Green Bank Facility
- TechConnectWV
- The Clay Center for the Arts & Sciences
- West Virginia High Technology Consortium Foundation
- TMC Technologies, Inc.
- Polyhedron Learning Media, Inc.
- Dr. Anne Cavalier

www.nasa.wvu.edu



Student Research

Complexation of Aluminum by Nitrogen-Containing Ligands

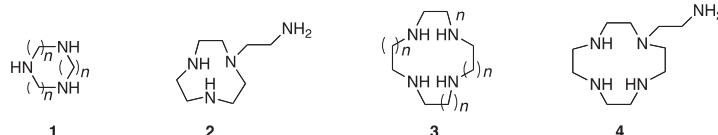
Hannah Cavender, West Virginia State University

I am a biology major with a minor in chemistry at West Virginia State University in Charleston, West Virginia. Dr. Genia Sklute, professor of chemistry at my university, approached me with the idea of developing a rational design of ligands that could selectively chelate aluminum and serve as a model cation. A ligand is a chemical compound that is capable of creating coordinate bonds with a metal. In our study we targeted ligands that can potentially complex aluminum, which increased solubility in acidic soils ($\text{pH} < 5.5$) can damage vertebrate DNA and inhibit plant root growth. Specifically, we were interested in macrocyclic-ligands with nitrogen donor atoms due to the high affinity of Al to nitrogen. Macrocyclic-ligands have higher kinetic and thermodynamic stability over their non-cyclic counterparts.



To better predict the ability of the ligand to complex to the Al this study utilized *Molecular Mechanics Merck Molecular Force Field (MMFF)* calculations. In this research we examined ideal macrocyclic cavity size dimensions, shape and topology of Al^{+3} ion, substituent effects with addition of pendant arms, number and arrangement of nitrogen atoms, and the effect of conformational flexibility/rigidity on stability of nitrogen-ligand Al complex. We determined the ideal macrocycle cavity dimensions by comparison of the change in C-C and C-N bond lengths of the ligand, and Al-N bond angles before and after the addition of the Al^{+3} ion. The first family of compounds we investigated was the triazacrown macrocycles **1**. The ligand that showed the best results based on the MMFF calculations from this family was 1,4,7-triazone **1** ($n=2$), with no change in C-C and C-N bond lengths and only minor distortion of the bond angles of Al-N by an average of 15° . We further investigated the effect of addition of a pendant arm to the above-mentioned ligand on the stability of the complex. Ligand **2** possesses additional nitrogen, which we placed to create a cage-like structure for the aluminum to bind. In this case there was expansion of the C-C bonds (0.18 \AA) and a slight decrease in the contraction of the C-N bonds (0.07 \AA). Al-N bond angles were distorted by an average of 12° .

The next family of compounds that we investigated was the tetraazacycloalkanes **3**. This family also has four nitrogen donor atoms within the ring. 2-(1,4,7,10-tetraazacyclododecan-1-yl)ethanamine **3** ($n=1$) showed the best results with minor expansion in C-C bonds (0.02 \AA) and contraction in C-N bonds (0.08 \AA), as well as distortion of the Al-N bond angles by an average of 12° . The addition of the pendant arm in this case **4** showed a similar trend. The expansion of the C-C bonds (0.02 \AA) was the same; however, the C-N bonds showed a decrease in contraction (0.08 \AA). There was also a decrease in the distortion around the Al-N bond angles by an average of 10° . With these results in hand, we began the synthesis of compound **4**. We will continue with this research in the 2013-14 academic year.



NASA/Wisconsin Space Grant Consortium

CONSORTIUM DESCRIPTION

The mission of the WSGC is to use the excitement and vision of space and aerospace science to equip the citizens of Wisconsin with the math, science and technology tools they need to thrive in the 21st century. We are committed to supporting the aerospace research and education efforts of each Affiliate regardless of type, size, or geographic location. The directions of the WSGC are determined by an Advisory Council in which each Affiliate is equally represented, and all funding is competitively awarded through procedures that have been well established by this Council. In this way, the WSGC can utilize the diversity of our aerospace community, advancing the best and brightest through its programs. Cooperation in our diversity, inclusiveness, joint decision-making through our Advisory Council, and stimulating innovation through competitive funding are the hallmarks of the WSGC.

The overarching goal or vision of the WSGC is to improve Wisconsin's future development and eminence in aerospace and space-related science, design, and technology. We strive to give voice to all Wisconsin aerospace stakeholders, allowing them to define the needs of the state so we may endeavor to meet those needs through the framework of the NASA strategic plan.

Wisconsin Space Grant Consortium key programs include the following:

SUMMARY OF WSGC PROGRAMS

- Undergraduate research and scholarships
- Graduate research and scholarships
- Internships at NASA centers and industry partners
- Student rocket competitions
- Student high altitude balloon program
- STEM teacher training and hands-on activities for K-12 students
- Informal STEM education programs
- Faculty research and curriculum enhancement grants

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 www.uwgb.edu/wsgc



Find us on Facebook

LEAD INSTITUTION

University of Wisconsin-Green Bay

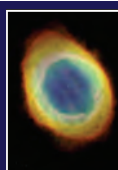
AFFILIATES

- Aerogel Technologies, LLC
- AIAA—Wisconsin Section
- Alverno College
- Astronautics Corporation of America
- BioPharmaceutical Technology Center Inst
- Carroll University
- Carthage College
- College of Menominee Nation
- Concordia University Wisconsin
- Crossroads at Big Creek
- Experimental Aircraft Association
- Great Lakes Spaceport Education Fnd Inc
- Lawrence University
- Marquette University
- Medical College of Wisconsin
- Milwaukee School of Engineering
- Orbital Technologies Corporation
- Ripon College
- St. Norbert College
- Space Explorers, Inc.
- Spaceflight Fundamentals, LLC
- Spaceport Sheboygan
- University of Wisconsin-Fox Valley
- University of Wisconsin-La Crosse
- University of Wisconsin-Madison
- University of Wisconsin-Milwaukee
- University of Wisconsin-Oshkosh
- University of Wisconsin-Parkside
- University of Wisconsin-Platteville
- University of Wisconsin-River Falls
- University of Wisconsin-Sheboygan
- University of Wisconsin-Stevens Point
- University of Wisconsin-Stout
- University of Wisconsin-Superior
- University of Wisconsin-Whitewater
- Western Technical College
- Wisconsin Aerospace Authority
- Wisconsin Dept of Public Instruction
- Wisconsin Dept of Transportation
- Wisconsin Lutheran College





WISCONSIN SPACE GRANT CONSORTIUM



STUDENT RESEARCH

A SCALABLE LUNAR MINER PROTOTYPE

Aaron Olson, University of Wisconsin—Madison

ABSTRACT

The Mark IV (M-4) project will address how current and emerging In-Situ Resource Utilization technology can be integrated into a scalable lunar miner prototype. The design of the M-4 miner will use the Mark-III (M-3) design from the Fusion Technology Institute at the University of Wisconsin-Madison as reference. The M-3 was designed to extract solar wind volatiles (H₂, ⁴He, ³He, CO₂, CH₄, N₂, H₂O) to support the ³He fuel requirements for future terrestrial fusion power plants and the yearly N₂, H₂O, CO₂, and O₂ needs of potentially hundreds of lunar inhabitants. The major subsystems of the M-3 consist of a bucket wheel excavator, regolith separation and movement systems, a heater, tracks for locomotion, solar and fuel cell power systems and a volatile storage system. The M-4 design drivers will be based on a number of criteria including, but not limited to, the available payload mass of lunar landing systems, requirements for larger and/or more effective regolith heating systems, available systems to compress or cool volatiles for storage, and the best method to demonstrate system scalability. Following the M-4 design, the plan is to build and test aspects of the prototype's regolith processing and heating systems. The results from this project will directly impact the design of future mining systems at NASA or private industry.



WSGC IMPACT

The Wisconsin Space Grant Consortium (WSGC) has been a tremendous aid in my professional development. I have been an intern at two NASA centers (Goddard and Langley) and have also been involved in NASA's University Microgravity Research Program and the inaugural X-Hab Challenge. Outside of NASA's available opportunities, I was also a crew member of the UW-Madison's 110th Mars Desert Research Station Crew. WSGC supported me financially through nearly all of my undergraduate extracurricular activities, not only making them possible, but also allowing me and the teams that I have been a part of to succeed as well. Now, as a graduate student, I have been fortunate to be selected as the 2013-2014 Dr. Laurel Salton Clark Memorial Graduate Fellow by the WSGC. I will be using the fellowship support to develop part of a prototype lunar mining system and cover costs of travel to a professional conference to present my work. I am extremely grateful for all of the support the WSGC has given me throughout my college education. Their support has helped introduce me to many of the challenges for the future of space exploration technology and has also given me the tools to explore new solutions to these challenges.



I think that as a society we've only begun to learn about and take advantage of what is available beyond our atmosphere. One of my professional goals is to help society realize the economic and scientific benefits from space. In this vein, I see myself becoming an innovator in the nascent commercial space resources industry. Much closer to home, I would also like to apply the same extreme-environment engineering skills needed for space in developing areas around the world that, like space, lack existing infrastructure. I believe the future is very bright for many developing areas on Earth or beyond, and I want to be a part of making the future a reality.

WSGC: Promoting STEM fields by recruiting and training the next generation of aerospace stakeholders

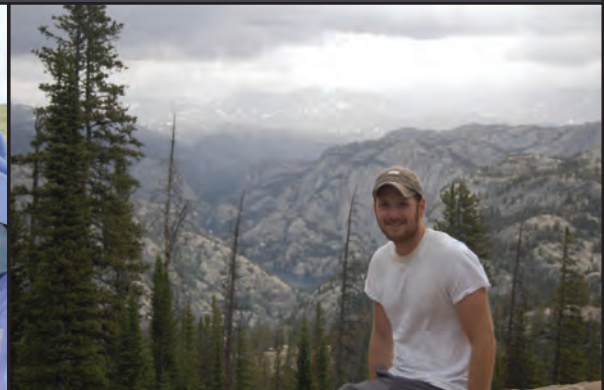


WYOMING

NASA Space Grant Consortium

National Space Grant College and Fellowship Program

Inspiring the next generation of scientists and explorers...



WYOMING NASA SPACE GRANT

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Our Mission

- To promote a strong educational base in STEM at all grade levels.
- To encourage cooperation and communication among industry, government, and educational institutions.
- To encourage interdisciplinary training, research, and public service programs related to STEM and aerospace.
- To recruit and train professionals, especially women and minorities, for careers in STEM.
- To develop state research infrastructure to enhance workforce and economic development in WY.
- To raise awareness of Space Grant programs and partnerships.

Lead Institution

University of Wyoming

WSGC Affiliates

- Casper College
- Central Wyoming College
- Eastern Wyoming College
- Embry-Riddle Aeronautical University—Cheyenne
- Laramie County Community College
- Northern Wyoming Community College District
 - Sheridan College
 - Gillette College
- Northwest College
- Western Wyoming Community College
- Casper Planetarium
- Wickman Spacecraft & Propulsion Co.
- FE Warren Air Force Base

Summary of WSGC Programs

Wyoming NASA Space Grant sponsors educational and research programs in the state of Wyoming in support of NASA's missions. We also serve as a link between citizens of the state and NASA programs. Our programs include:

- Scholarship programs for community college STEM students
- NASA Center internships for college students
- Undergraduate and graduate research fellowships for students at community colleges, the University of Wyoming, and partner HBCUs
- Research and education grants for college faculty
- Resources and educational programs for Wyoming K-12 teachers and students



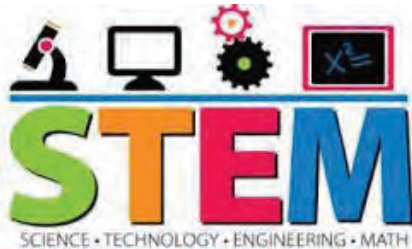
Undergraduate Research Highlight: Tricia Jensen

Engineering a Light Activated Caspase-3 for Cancer Treatment and Cell Biology Research

NASA's Science and Human Exploration Goals state that human health and safety must be insured in manned space missions. A major danger in extended space travel is radiation. NASA scientists within the Space Radiation Program Element are working to study the impact of long-term exposure to space radiation. Space contains three types of ionizing radiation: Trapped Radiation, Galactic Cosmic Radiation, and Solar Particle Events. These types of radiation contain high-energy particles that can cause cellular changes in human tissue. Due to this fact, space radiation poses serious health risks such as visual disorders, radiation sickness, central nervous system damage and specifically the possibility of cancer.

For the vast majority of tumors, no curative drugs exist, while nonspecific cancer treatments, such as radiation and chemotherapy, are debilitating and not always effective. My research project intends to create a 'silver bullet' to destroy tumors. The purpose is to engineer a readily activated enzyme, caspase-3, whose expression results in cell death, apoptosis. Caspase-3 is the terminal protease that induces apoptosis in mammalian cells; once activated, the cell dies. The caspase-3 will be engineered to be activated by red light. Once it is delivered to tumor cells, e.g. by tumor-specific viruses or bacteria, it can be activated by harmless red light delivered by powerful LEDs or lasers, destroying the tumor. In the lab, we have already fused a photoreceptor from a bacteriophytochrome to the specific caspase-3 mutant activated by dimerization. The aims of this research project are to identify light-activated derivatives of the bacteriophytochrome-caspase-3 fusion proteins, to optimize their performance in *Escherichia coli*, and, if time permits, to construct a recombinant virus expressing the light-activated caspase for testing in mammalian cells. We believe that ultimately our light-activated caspase will become one of the least harmful and most specific cancer treatments, both in space and on earth.





District of Columbia Space Grant Consortium

About the District of Columbia Space Grant Consortium

From its location in the nation's capital, the DCSGC utilizes the city's rich and unique resources. Washington, D.C. is the center of power in the U.S. government, and is home to NASA Headquarters, the Smithsonian Institution, and many other space, science, and education associations and organizations. Annual national meetings of the National Council of NASA Space Grant Directors are hosted in Washington, D.C. by the DCSGC. Founded in 1991, the DCSGC shares the excitement and understanding of space and science among scientists, educators, students, and the general public. Our educational programs, activities, and publications are supported by NASA, DCSGC affiliate members, and various federal, non-federal, corporate, and non-profit contributors.

Mission Statement

Our mission is to support NASA's goals by contributing to STEM workforce development in Washington, D.C., utilizing the rich resources of our diverse affiliate institutions through programs in fellowships/scholarships, research infrastructure, precollege, higher education, and public service to inform the public and attract and retain students to pursue STEM advanced degrees and careers.

Summary of Supported Programs

Graduate and Undergraduate Fellowships and Scholarships | NASA Center Internships | Faculty and Student Research Projects | Informal STEM Educational Programs | Higher Education and Research Infrastructure Support | Public Outreach | K-12 Teacher Training

Academic Affiliates

Lead Institution: American University

Catholic University of America | Gallaudet University | George Washington University | Georgetown University | Howard University | Trinity Washington University | University of the District of Columbia

Non-Profit Affiliates

ARIES Scientific | National Center for Earth and Space Science Education | S.M.A.R.T., Inc. | Space Explorers | The INSPIRE Project, Inc.

Tel:
(202) 885-2755



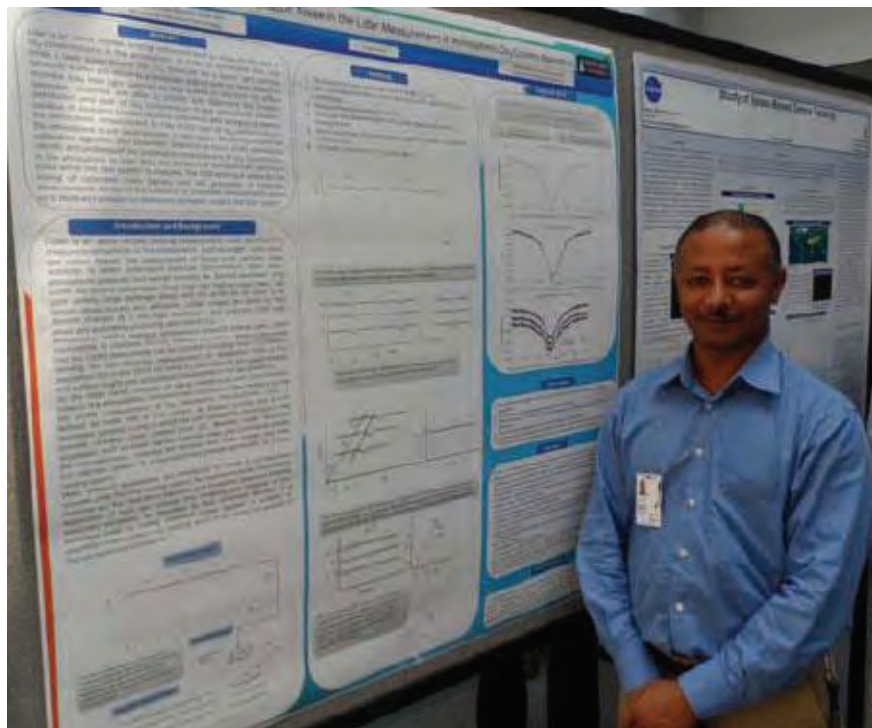
Web:
DCSpaceGrant.org



Deressie Mebratu

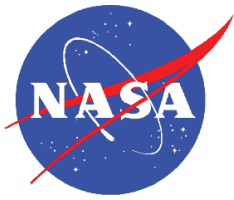
Howard University
College of Engineering,
Architecture and
Computer Sciences

The DCSGC supported Deressie Mebratu, a doctoral engineering student at Howard University, with two scholarships to intern at NASA Goddard Space Flight Center during Summer and Fall 2012. His NASA mentor was so impressed with the caliber of his research



that he continued to fund him on the project through Spring and Summer 2013. Deressie hopes to be offered a full-time position at NASA GSFC upon completion of his Ph.D. Deressie submitted an article on his NASA research that was published in the Spring/Summer 2013 issue of the INSPIRE Journal, which can be found on The INSPIRE Project's website at: <http://theinspireproject.org>. NASA also asked Deressie to serve as a NASA Student Ambassador, and his NASA Student Ambassador profile can be seen on NASA's website. As a NASA Student Ambassador, Deressie generates awareness at Howard University of the vast STEM opportunities available at NASA for underrepresented minorities. He also serves as a mentor to STEM students, including an undergraduate DCSGC scholarship recipient.

In his own words - "I have been working at NASA/Goddard since last summer's INSPIRE internship and will continue working in the spring. In addition, NASA GSFC offered me a 2013 summer intern position. I am working the same branch and plan to defend my dissertation in the coming fall. I work in the Microwave Instrument Technology Branch to analyze and filter non stationary stochastic noise which comes from Lidar measurement of CO2 absorption line. In general, Lidar is an active remote sensing instrument built to measure the level of CO2 concentrations in the atmosphere. However, because of stochastic and atmospheric turbulence and background noise in the atmosphere, measurement by lidar of the level of CO2 concentration in the atmosphere is not ascertainable. Therefore, our research group introduced both the calibration algorithm and Ensemble Detection Analysis (EDA) methods to identify and understand the uncertainty measurement of CO2 concentration in the atmosphere by lidar. The EDA technique allows for the mixing of calibrated noise signals, and the production of ensemble measurements. Review of the collection of ensemble measurements allows us to study and analyze non-stationary stochastic noise in the lidar system."



NASA Puerto Rico Space Grant Consortium

Advancing NASA's Mission in Puerto Rico

www.prsgc.upr.edu



Lead Institution

University of Puerto Rico
Central Administration

Consortium's Affiliates

- University of Puerto Rico at Mayagüez
- UPR Mayagüez Planetarium
- University of Puerto Rico at Río Piedras
- University of Puerto Rico at Humacao
- University of Puerto Rico at Cayey
- University of Puerto Rico at Arecibo
- University of Puerto Rico at Bayamón
- University of Puerto Rico at Carolina
- Ana G. Méndez University System
- Inter American University at Bayamón
- PR NASA Explorer School
- National Astronomy and Ionosphere Center (Arecibo Observatory)
- PR Department of Education
- Univisión-PR
- StarBase-PR
- EcoExploratorium

Fellowships/Scholarships: Twenty STEM students receive full support (stipend and tuition) each academic year. They participate in NASA-related projects developed by researchers in the Jurisdiction in collaboration with NASA centers.

Internships: Twenty STEM students spend 10-15 weeks doing research at a NASA center, a National Lab, or Aerospace Industry, under the supervision of NASA scientists and engineers.

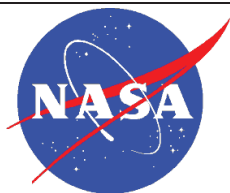
Hardware Projects: Hands-on minds-on hardware projects (CubeSat, RockSat, and Moonbuggy) are implemented in collaboration with NASA centers.

Research Experiences: STEM students engage in NASA-related research or education projects under the supervision of researchers and faculty.

Seed Grants: Faculty members are supported to engage in NASA-related interdisciplinary research and education projects that expand the Jurisdiction's capabilities in NASA-related fields.

Teacher Workshops: Hands-on professional development activities provide new NASA content and NASA educational materials to in-service teachers, pre-service teachers, and informal educators.

Public Outreach: Educational activities targeted at the general public employ NASA science and technology to inspire the young generation into becoming STEM professionals.



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FY12 PROGRAM BENEFIT TO OUTCOME 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals*

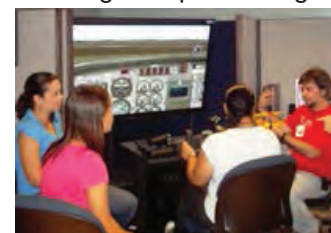
Students that participated in PRSGC's Fellowship Program, NASA Internships and hands-on hardware projects were hired by NASA, other federal agencies or the Aerospace Industry, as follows:

- Enid Contés (PRSGC Fellow and NASA Ames Intern) at NASA Ames
- Abigail Rodríguez (PRSGC Fellow and NASA Glenn Intern) at NASA Glenn
- José Molina (PR CubeSat and NASA Marshall Intern) at NASA Marshall
- David Ramos (NASA Goddard Intern) at Department of Commerce
- Juan Colón (PR CubeSat) at Naval Research Lab
- Emmanuel Avilés (PR CubeSat) at Naval Surface Warfare Center
- Néstor Vargas (PR CubeSat) at Honeywell Aerospace
- Leysha González (PR CubeSat) at Honeywell Aerospace



FY12 PROGRAM BENEFIT TO OUTCOME 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty*

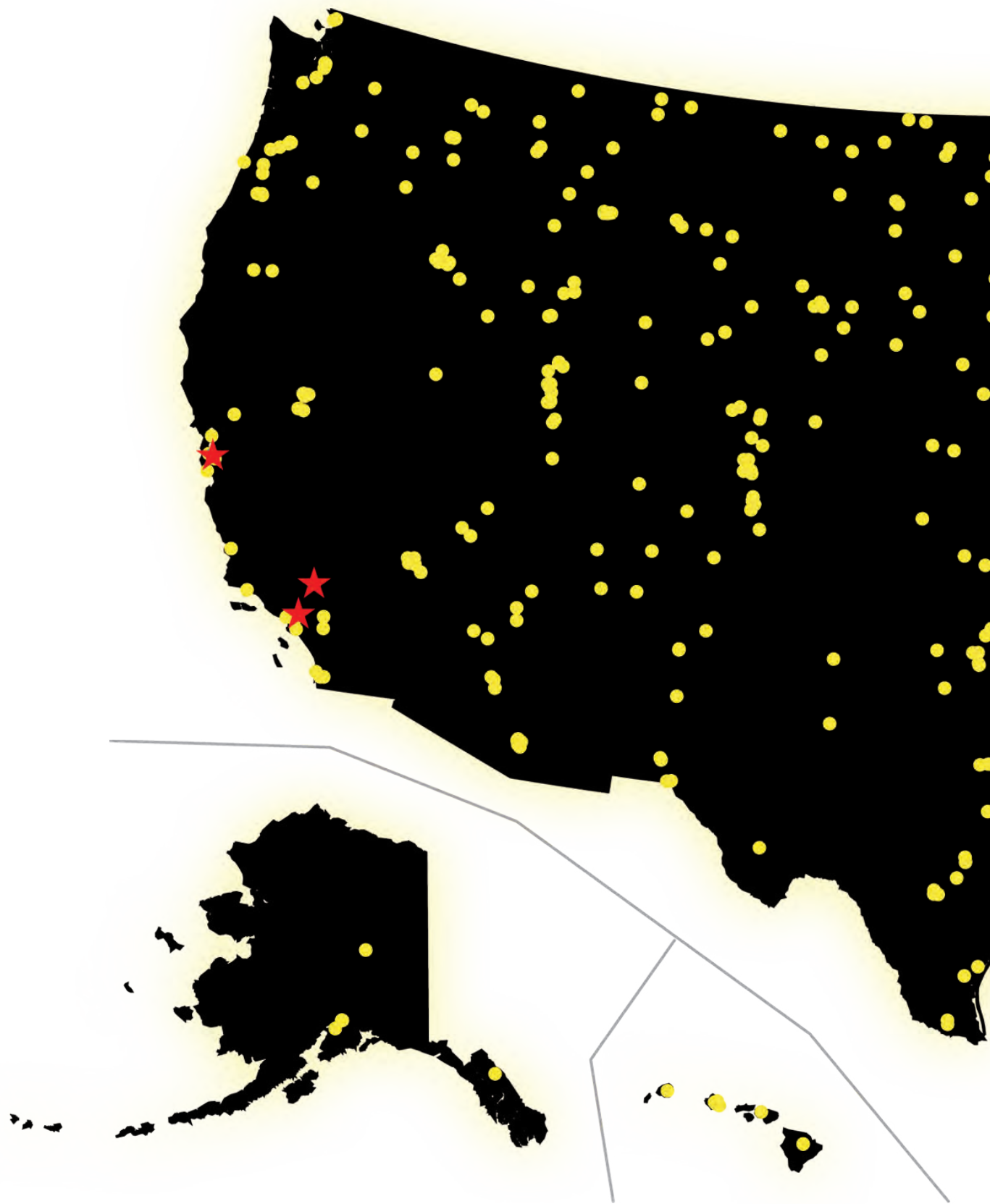
The NASA Aerospace Educational Laboratory (AEL) located at the University of Puerto Rico, Arecibo Campus, engages students in real world challenges pertaining to Aeronautics and Space Exploration. The AEL is a state-of-the-art, electronically enhanced, computerized classroom that puts cutting-edge technology at the fingertips of middle and high school students and teachers. It houses real aerospace hardware and software including an Advanced Flight Simulator, a laboratory-grade, a research wind tunnel, and a working, short-wave radio receiver and hand-held global positioning systems, or GPS, for aviation. In ten unique workstations, participants explore technology through hands-on, minds-on activities that model real-world challenges in aerospace. The primary mission of AEL is to motivate students to choose STEM careers upon graduating from high school. After completing the AEL experience, 67% of the students indicated interest in pursuing STEM careers and 100% indicated high regard for STEM professionals, a large increment from the initial 35% and 65%, respectively.

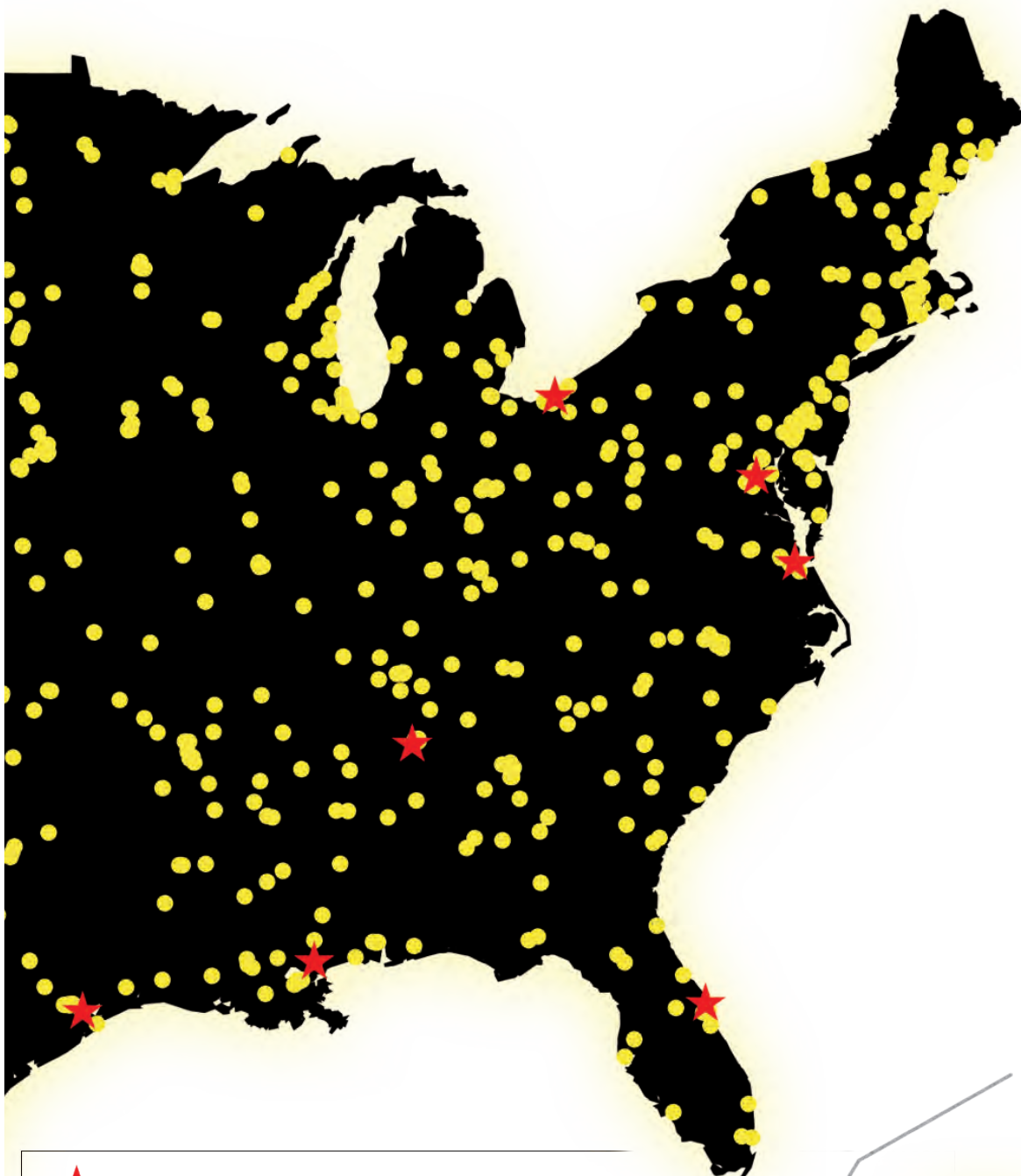


FY12 PROGRAM BENEFIT TO OUTCOME 3: *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission*

Astronaut Gregory (Box) Johnson (STS-123 and STS-134) visited Puerto Rico for four days to give presentations at different places across the Jurisdiction. He was the main speaker at public activities organized at the Mayagüez Campus and Humacao Campus of the University of Puerto Rico, reaching a total of 1800 participants in four days of activities. Through this visit, Astronaut Johnson reached the general public across the Jurisdiction and conveyed the message that education is essential in order to succeed in life, and that NASA welcomes students from all socio-economic levels and races to join its excellent workforce. This high-impact activity was done in partnership with NASA Glenn Research Center.







★ NASA CENTERS

● SPACE GRANT COLLEGES
& UNIVERSITIES



