

WISCONSIN SPACE GRANT CONSORTIUM

PROGRAM OVERVIEW

FY 2014-15



STEM EDUCATION AND AEROSPACE WORKFORCE DEVELOPMENT FOR WISCONSIN

WISCONSIN SPACE GRANT CONSORTIUM

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.

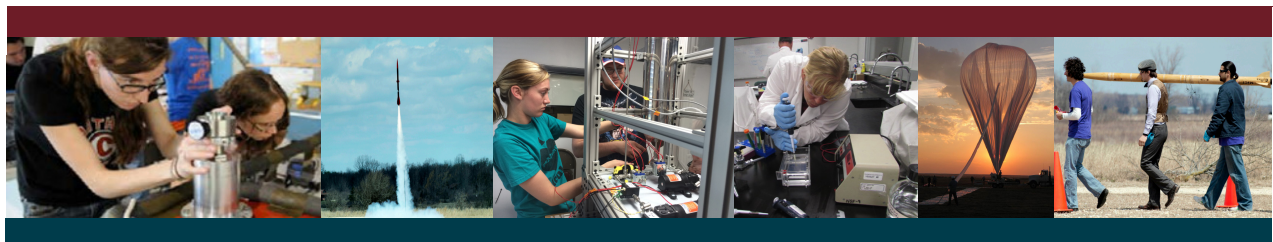


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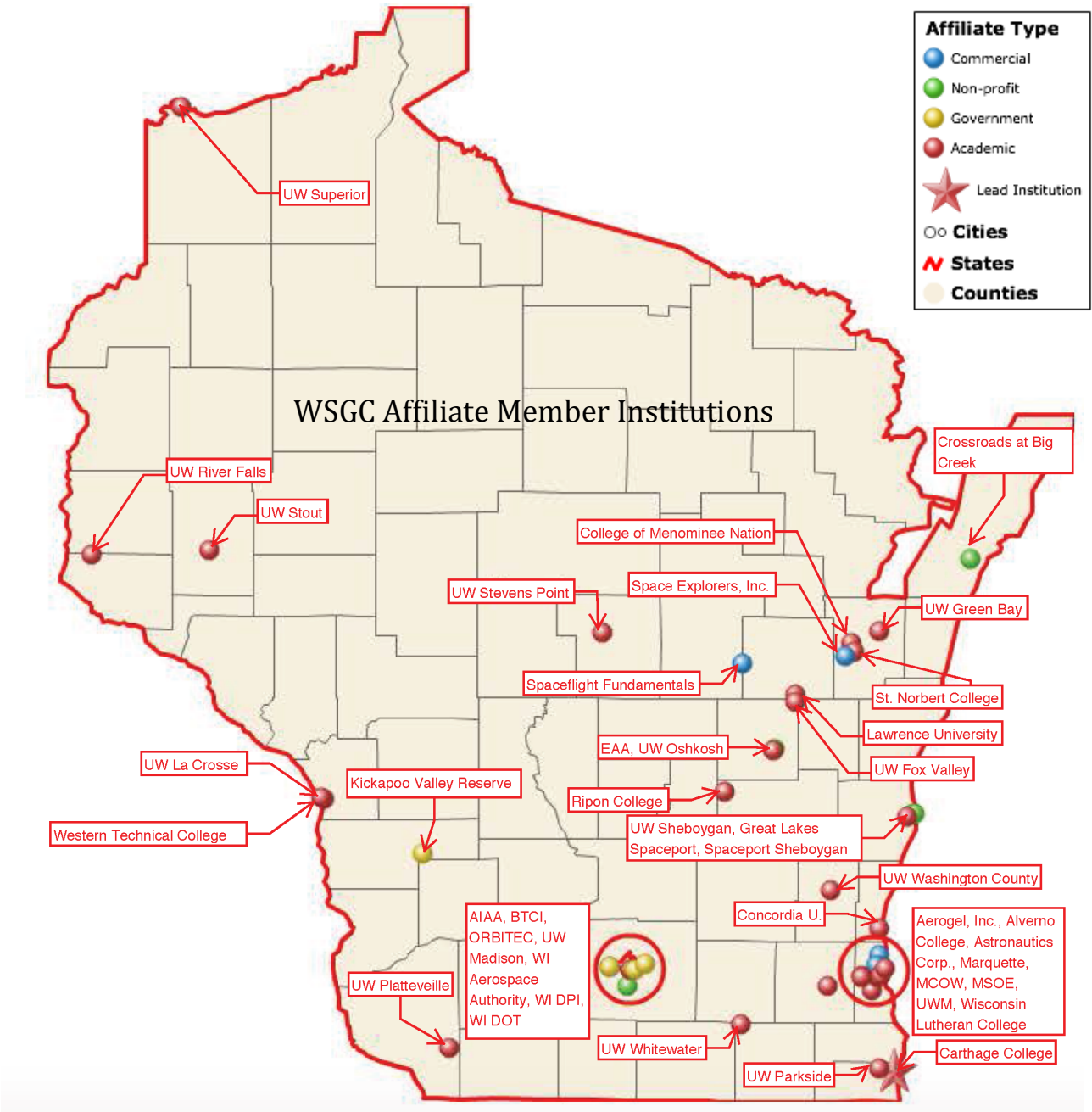
SPACEGRANT.CARTHAGE.EDU



A network of 40+ academic, industrial and governmental partners dedicated to building a vibrant aerospace workforce in Wisconsin

WSGC provides over \$250,000/year in *competitively awarded* funding to college and university students and faculty.

WISCONSIN SPACE GRANT
CONSORTIUM



Transformative experiences and training opportunities that develop, nurture and employ young STEM professionals in Wisconsin aerospace.

WISCONSIN SPACE GRANT CONSORTIUM



STUDENT PROGRAMS

WSGC has a unique focus on developing STEM talents in students who would not otherwise have considered a career in a STEM field.

- Focus on two-year students
- K-12 investments in research-based STEM pedagogies
- Authentic and collaborative research experiences for undergraduates

Scholarships and Fellowships

- \$1,500 Scholarships to outstanding undergraduate students who are pursuing aerospace, space science, or other interdisciplinary space-related studies or research.
- \$4,000 Research Fellowships to qualified undergraduate students to create and implement a small research study of their own design.
- \$5,000 Graduate Research Fellowships to qualified graduate students to pursue research aligned with a NASA mission focus.
- The Dr. Laurel Salton Clark Memorial Graduate & Professional Research Fellowship Award was established in 2004 in honor of Dr. Laurel Clark, Columbia Space Shuttle astronaut and resident of Wisconsin.
- Awarded to students at both two-year and four-year institutions.

Internships

- NASA Center Internships are funded by state Space Grant Consortia
- NASA Center internships are intensive residential experiences at a NASA center. These take place over the summer and/or for a school semester.
- Wisconsin Aerospace Internships: WSGC places students with Affiliate Member companies such as ORBITEC, Astronautics Corp., Experimental Aircraft Association, and Space Explorers, Inc.

Student Satellite Program

- WSGC runs the Elijah High-Altitude Balloon project in which student teams design and build science payloads to be launched and retrieved from a high-altitude balloon that ascends up to 100,000 feet or more before bursting.
- WSGC runs the Collegiate Rocket Launch competition. A dozen or more teams compete each year in a rocket launch event featuring a scientific payload mission element.

Focus on funding projects and developing partnerships that align with state aerospace workforce needs and priorities. Example: Sheboygan startup, VibeTech, works with several in-state engineering programs to develop senior design experiences for students to work on commercially relevant projects.

WISCONSIN SPACE GRANT CONSORTIUM



FACULTY PROGRAMS

Higher Education Incentives

- HEI is a seed-grant program for undergraduate education projects that support the most innovative ideas on how to increase the space and aerospace content of undergraduate university and college offerings.
- HEI provides funding for intensive summer research partnerships and internships for student to participate in aerospace technology development with in-state commercial partners.

Research Infrastructure

- The Research Infrastructure Program (RIP) is designed to provide support to faculty and research staff from WSGC universities and colleges seeking to initiate a new research program, and from WSGC industrial affiliates to establish a space-related research program.
- Each year, publications, technology transfers and external investments arise from RI program investments.

PRE-COLLEGE AND OUTREACH PROGRAMS

Aerospace Outreach Program

- The Aerospace Outreach Program (AOP) provides planning grants and supplemental grants for new or ongoing projects which have space-related content.
- 100's of students in communities across the state are supported in their STEM education activities by WSGC funding.

Special Initiatives Program

- The Special Initiatives Program (SIP) provides planning grants and supplemental grants for new or ongoing projects that have space-related content and are intended to encourage, attract, or retain underrepresented groups in Science, Technology, Engineering, and Mathematical fields, especially women, minorities, and persons with disabilities.
- The SIP funds educator programs that provide K-12 students with access to affiliate planetarium programs and Consortium-sponsored activities such as rocket and balloon launches.

WSGC partners with commercial and NASA funding agencies to provide students with unique and impactful experiences that lead to jobs in Wisconsin's aerospace industry and to advanced graduate work in mission-critical areas of national concern.

WISCONSIN SPACE GRANT CONSORTIUM



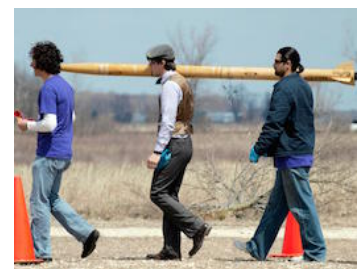
WSGC Funding supports spaceflight technology development through partnerships with Kennedy Space Center and through the Johnson Space Center Reduced Gravity Office. Space Grant Funded research highlighted in NASA's 2015 *SpinOff* magazine and Kennedy Space Center's *Spaceport Magazine* 2014 1(8).



WSGC Funding supports in-state internships with ORBITEC and other commercial aerospace companies in the state. Students interning at ORBITEC work on commercializing fire suppression equipment inspired by ORBITEC's unique rocket engine technology.



WSGC runs the national rocket competition *First Nations Launch*. FNL invites teams from tribal colleges and AISES chapters around the country to compete in a year-long design-build-launch competition at Bong Recreation Area in Kansasville, WI. Most students have never considered a career in STEM before participating in FNL.



WSGC runs the Tethered Aerostat Program for STEM first-exposure internships for students at Affiliate two-year colleges. Students are paid a stipend of \$8000 to design, build, and fly a remote sensing experiment aboard a tethered aerostat. The TAP incentivizes students at two-year schools to enroll and persist in STEM fields, and ultimately find employment in Wisconsin's technical workforce.



Learn more about these programs and several more at spacegrant.carthage.edu

REQUEST FOR FY 2015 APPROPRIATIONS
SUMMARY

WISCONSIN SPACE GRANT
CONSORTIUM



- Request no change to current funding level of \$40 million (nationally).
- Support the distribution of equal funds to each state (plus D.C. and Puerto Rico), based on a 5-year proposal, so that Space Grant Consortia may competitively distribute the funds within their own jurisdiction to meet local/state, regional, and national needs.
- Support for another 5-year, competitive solicitation to begin immediately to sustain the state-based Space Grant national network.

REQUEST FOR FY 2015 APPROPRIATIONS

WISCONSIN SPACE GRANT CONSORTIUM



Organization Making Request: Wisconsin Space Grant Consortium

Organization Point of Contact: Dr. Kevin Crosby

Phone Number: 262-551-5855

Email: kcrosby@carthage.edu

Program or Language Request: Language Request

Appropriations Subcommittee: Commerce, Justice, Science (CJS)

Agency: NASA

Account: NASA Education

Program Name: National Space Grant College and Fellowship Program

Program Purpose: Space Grant provides funding to 50 states, the District of Columbia and the Commonwealth of Puerto Rico to enhance science and engineering education. The program provides hands-on experiences for US graduate and undergraduate students to prepare them for STEM careers. Space Grant is a state-based program that is responsive to state STEM needs as well as national priorities. States contribute a match to leverage federal dollars so that more students are reached.

Fiscal Year 2014 Funding Received: \$40 million

Fiscal Year 2015 Funding Received: \$40 million

Level of Funding Requested for Fiscal Year 2016: \$40 million

Proposed Program Funding President's Fiscal Year 2016 Budget: \$24 million

Requested Report Language or Bill Text: "The Committee supports a funding amount of \$40 million for the National Space Grant College and Fellowship Program (Space Grant), and directs NASA to allocate the entire \$40 million to consortia lead institutions in the 52 participating jurisdictions for the implementation and expansion of activities funded under their current base Space Grant award."

FY 2015 STUDENT FUNDING BREAKDOWN

85 STUDENTS AND FACULTY SIGNIFICANTLY FUNDED
BY WSGC

WISCONSIN SPACE GRANT CONSORTIUM



- 15 research projects
- 16 Team balloon, rocket, microgravity projects
- 6 Educator and outreach projects
- 26 publications resulting from WSGC-funded work in *Proceedings of the Wisconsin Space Conference*

Students and institutions from each Congressional district represented in FY 2015 funding portfolio.

Students contributing papers and project reports to the *Proceedings of the Wisconsin Space Conference* journal are identified on the following pages.



Simpson Street Free Press



BTCI Flight Camp for Girls



Wisconsin Space Conference



Collegiate Rocket Launch



First Nations Launch Competition



High Altitude Balloon Program



Zero-g Propellant Mass Gauging



Lunar Mining Competition



Remote Sensing Experiment

Brendan Krull

Status: Junior, Physics/Mechanical Engineering

Advisor: Dr. Kevin Crosby

Research Topic: The Onset of Normal Field Instability
in a Ferrofluid in a Reduced Gravity Environment



Award: Undergraduate Scholarship, \$3000.00

Abstract: A ferrofluid is a magnetic liquid comprised of nanoscale ferrous particles suspended in a low-viscosity carrier fluid. When subjected to a magnetic field, the surface of a ferrofluid deforms into peaks and valleys along the magnetic field lines. The onset of surface deformation is called the normal field instability. The theory describing the NFI identifies a critical magnetic field below which no magnetically driven surface deformations occur. The critical field depends on the gravitational acceleration and, according to the theory, should disappear as local gravitational acceleration approaches zero. While there have been previous demonstrations of the normal field instability in a reduced gravity environment, data has been inconclusive on the existence of a critical magnetic field in reduced gravity. For our work, we designed a sounding rocket payload for a suborbital rocket mission. Our experiment incorporates a ferrofluid sample and a uniform magnetic field which can be varied across a discrete range of values to observe surface deformations at different applied fields. During the microgravity portion of the rocket's flight, we obtain video of the ferrofluid's behavior and compare it to data taken in Earth's gravity. A team of five undergraduate students designed and built the payload that will characterize the role of gravity in setting the critical magnetic field strength for the onset of the NFI. Data will be used to further understanding of ferrofluid behavior in a microgravity environment to advance its use in various space-based applications.

Biography: I was born in Hinsdale Illinois, and, when I was 10, I moved to California, and later to southeastern Wisconsin. Throughout my childhood, I was always attracted to building things, and would constantly disassemble and reassemble structures made from LEGO bricks. In middle and high school, I found that I was good at math and the sciences, and sought opportunities to study math, physics, and computer science, culminating in a 3 week internship at Fermilab at the end of my Senior year of high school. During my undergraduate studies, I have continued to study physics, and recently led a team in the development of a ferrofluid experiment for the RockSat program.

Congressional District: 1

Congressional Representative: Paul Ryan



Carthage College

Amelia Gear

Status: Junior, Physics/Art

Advisor: Dr. Kevin Crosby

Research Topic: The Onset of Normal Field Instability in a Ferrofluid in a Reduced Gravity Environment

Award: Undergraduate Scholarship, \$3000.00

Abstract: A ferrofluid is a magnetic liquid comprised of nanoscale ferrous particles suspended in a low-viscosity carrier fluid. When subjected to a magnetic field, the surface of a ferrofluid deforms into peaks and valleys along the magnetic field lines. The onset of surface deformation is called the normal field instability. The theory describing the NFI identifies a critical magnetic field below which no magnetically driven surface deformations occur. The critical field depends on the gravitational acceleration and, according to the theory, should disappear as local gravitational acceleration approaches zero. While there have been previous demonstrations of the normal field instability in a reduced gravity environment, data has been inconclusive on the existence of a critical magnetic field in reduced gravity. For our work, we designed a sounding rocket payload for a suborbital rocket mission. Our experiment incorporates a ferrofluid sample and a uniform magnetic field which can be varied across a discrete range of values to observe surface deformations at different applied fields. During the microgravity portion of the rocket's flight, we obtain video of the ferrofluid's behavior and compare it to data taken in Earth's gravity. A team of five undergraduate students designed and built the payload that will characterize the role of gravity in setting the critical magnetic field strength for the onset of the NFI. Data will be used to further understanding of ferrofluid behavior in a microgravity environment to advance its use in various space-based applications.

Congressional District: 1

Congressional Representative: Paul Ryan



CARTHAGE
COLLEGE

Carthage College

Kevin LeCaptain

Status: Junior, Physics/Mathematics

Advisor: Dr. Kevin Crosby

Research Topic: The Onset of Normal Field Instability in a Ferrofluid in a Reduced Gravity Environment

Award: Undergraduate Scholarship, \$3000.00

Abstract: A ferrofluid is a magnetic liquid comprised of nanoscale ferrous particles suspended in a low-viscosity carrier fluid. When subjected to a magnetic field, the surface of a ferrofluid deforms into peaks and valleys along the magnetic field lines. The onset of surface deformation is called the normal field instability. The theory describing the NFI identifies a critical magnetic field below which no magnetically driven surface deformations occur. The critical field depends on the gravitational acceleration and, according to the theory, should disappear as local gravitational acceleration approaches zero. While there have been previous demonstrations of the normal field instability in a reduced gravity environment, data has been inconclusive on the existence of a critical magnetic field in reduced gravity. For our work, we designed a sounding rocket payload for a suborbital rocket mission. Our experiment incorporates a ferrofluid sample and a uniform magnetic field which can be varied across a discrete range of values to observe surface deformations at different applied fields. During the microgravity portion of the rocket's flight, we obtain video of the ferrofluid's behavior and compare it to data taken in Earth's gravity. A team of five undergraduate students designed and built the payload that will characterize the role of gravity in setting the critical magnetic field strength for the onset of the NFI. Data will be used to further understanding of ferrofluid behavior in a microgravity environment to advance its use in various space-based applications.

Congressional District: 1

Congressional Representative: Paul Ryan



Carthage College

Tessa Rundle

Status: Junior, Physics

Advisor: Dr. Kevin Crosby

Research Topic: The Onset of Normal Field Instability in a Ferrofluid in a Reduced Gravity Environment

Award: Undergraduate Scholarship, \$3000.00

Abstract: A ferrofluid is a magnetic liquid comprised of nanoscale ferrous particles suspended in a low-viscosity carrier fluid. When subjected to a magnetic field, the surface of a ferrofluid deforms into peaks and valleys along the magnetic field lines. The onset of surface deformation is called the normal field instability. The theory describing the NFI identifies a critical magnetic field below which no magnetically driven surface deformations occur. The critical field depends on the gravitational acceleration and, according to the theory, should disappear as local gravitational acceleration approaches zero. While there have been previous demonstrations of the normal field instability in a reduced gravity environment, data has been inconclusive on the existence of a critical magnetic field in reduced gravity. For our work, we designed a sounding rocket payload for a suborbital rocket mission. Our experiment incorporates a ferrofluid sample and a uniform magnetic field which can be varied across a discrete range of values to observe surface deformations at different applied fields. During the microgravity portion of the rocket's flight, we obtain video of the ferrofluid's behavior and compare it to data taken in Earth's gravity. A team of five undergraduate students designed and built the payload that will characterize the role of gravity in setting the critical magnetic field strength for the onset of the NFI. Data will be used to further understanding of ferrofluid behavior in a microgravity environment to advance its use in various space-based applications.

Congressional District: 1

Congressional Representative: Paul Ryan



East Troy High School

Luke Goestch

Status: Freshman, Gateway Technical College (Racine, WI)

Advisor: Matt Heer

Research Topic: Spatial ID Environmental Reader (SPIDER)

Award: Outreach, \$1780.00 (Team)

Abstract: The task at hand was to design, and build an experiment to test in microgravity. As with each team coming up with their own unique experiment, our team went with trying to solve the problem of astronauts always losing tools that they are working with aboard the International Space Station. This has always been a challenging issue for astronauts in space due to the microgravity environment. This problem is a potential high risk due to when tools or parts float away as they can get lost, lodged somewhere, or even damage other equipment. By creation of our device we hope to improve the livability and ensure greater safety for astronauts in space.

Congressional District: 1

Congressional Representative: Paul Ryan



East Troy High School

Jon Woods

Status: Freshman, Austin Peay State University (Clarksville, TN)

Advisor: Matt Heer

Research Topic: Spatial ID Environmental Reader (SPIDER)

Award: Outreach, \$1780.00 (Team)

Abstract: The task at hand was to design, and build an experiment to test in microgravity. As with each team coming up with their own unique experiment, our team went with trying to solve the problem of astronauts always losing tools that they are working with aboard the International Space Station. This has always been a challenging issue for astronauts in space due to the microgravity environment. This problem is a potential high risk due to when tools or parts float away as they can get lost, lodged somewhere, or even damage other equipment. By creation of our device we hope to improve the livability and ensure greater safety for astronauts in space.

Congressional District: 1

Congressional Representative: Paul Ryan

Aaron Olson

Status: Graduate, Senior, Mechanical Engineering

Advisor: Dr. Jerry Kulcinski

Research Topic: Design of a Lunar Solar Wind Volatiles Extraction System



Award: Graduate Fellowship; \$4000.00

Abstract: Two devices are being developed as part of a project to demonstrate the extraction of helium-3 and other volatiles from lunar regolith. The first is an implantation system to embed helium ions into JSC-1A lunar regolith simulant and the second is a counter flow heat pipe heat exchanger for the subsequent diffusion of the helium out of the regolith. This will simulate the previously proposed acquisition of helium-3 from the Moon for use in nuclear fusion reactors on Earth. Preliminary designs of both of these systems are discussed.

Biography: Aaron Olson is a University of Wisconsin-Madison PEOPLE Graduate. He was born in Kikwit, D.R. Congo and raised in Madison, WI. He earned a B.S. in Mechanical Engineering in 2012, recently completed his M.S. in Engineering Mechanics and Astronautics in May of 2014 and is pursuing a Ph.D. in this same field. During his undergraduate education, He studied abroad at the Institut Supérieur de l'Aéronautique et de l'Espace in Toulouse, France for a semester, had internships at both NASA Goddard Space Flight Center and NASA Langley Research Center, and was part of the 2011 winning NASA Exploration Habitat competition student team that built an expandable module for NASA's Deep Space Habitat Prototype. Aaron was the president of the UW-Madison chapter of Students for the Exploration and Development of Space, participated in NASA's Undergraduate Microgravity Research program and was also a crew member of the 110th Mars Desert Research Station Crew.

The Wisconsin Space Grant Consortium (WSGC) has been a tremendous aid in Aaron's professional development. WSGC supported Aaron financially through nearly all of his undergraduate extracurricular activities, not only making them possible, but also allowing him and the teams that he's been a part of to succeed as well. Now, as a graduate student, he has been selected as the 2013-2014 Dr. Laurel Salton Clark Memorial Graduate Fellow and a 2014-2015 Graduate Fellow by the WSGC. Aaron has also recently been named as a 2014-2015 NASA Space Technology Research Fellow. Aaron is researching the acquisition of lunar resources for future power generation and in-space life support purposes with Dr. Gerald Kulcinski

Congressional District: 2

Congressional Representative: Mark Pocan



BioPharmaceutical Technology Center

Barbara Bielie

WSGC Program: Special Initiatives Program

Research Topic: Science Outreach at the BTC Institute - Aerospace Outreach Program & Special Initiatives Program

Award: Outreach; \$1000.00 - Special Initiatives; \$2500.00/\$2500.00

Abstract: The BioPharmaceutical Technology Center Institute (BTC Institute) is a non-profit educational organization founded in 1993; located in Fitchburg, WI. During the summers of 2013 and 2014, the BTC Institute offered teacher training in biotechnology through two graduate education courses, Biotechnology: The Basics (2013 & 2014) and Biotechnology: Beyond the Basics (2013). Teachers of a wide variety of subjects with varied levels of teaching experience were active participants in this lab-based learning that provided teachers with training, background and curriculum materials including information about NASA and biotechnology. In addition to the teacher courses, the BTC Institute in partnership with the African American Ethnic Academy, Inc. (AAEA), a Madison non-profit organization, also offered "A Celebration of Life!", a science program for upper elementary and middle school students. The focus of the 2013 program was Energy and the focus of the 2014 program was Flight.

Congressional District: 2

Congressional Representative: Mark Pocan



Orbital Technological Corporation

Todd Treichel

WSGC Program: STEM

Research Topic: Rocket Science for Educators Using Rocket Design and Simulation Software

Award: Outreach; \$2500.00

Abstract: The Wisconsin AIAA chapter has leveraged the talent of its members to provide a variety of outreach opportunities for precollege aged students. Hands-on demonstrations, visual aids, and real-life space flight examples provide a foundation for bringing precollege aged students face-to-face with space-related science, designed hardware, technology, and potential benefits; increased interest in aerospace and space related fields that lead to study at the university level followed by career. The Rocket Science for Educators program consists of a workshop used to assist schools in implementing rocket science into respective math or science curriculums. Grant assistance provided by the Wisconsin Space Grant Consortium (WSGC) makes this workshop possible. In 2014 Spaceport Sheboygan teamed with AIAA for a training event where participating educators attended a weekend workshop and received design software training and associated set of rocket science materials that they may take back to their respective schools.

Congressional District: 2

Congressional Representative: Mark Pocan



Orbital Technological Corporation

Todd Treichel

WSGC Program: Industry Partnership

Research Topic: Human Factor Analysis of Light Emitting Diode Technologies for Cabin Lighting in Manned Space Flight Applications

Award: Industry Programs; \$4000.00

Abstract: Advantages of transitioning to Light emitting diode (LED) technologies in spacecraft are reduced mass, reduced occupied volume, reduced power, improved color control, longer operating life, and lower cost associated with power consumption and disposal. According to Brainard et al (2012) newly designed U.S. spacecraft, and ISS fluorescent tube replacements, must utilize LEDs in lieu of traditional artificial light sources to take advantage of technology improvements. Light emitting diode technologies remain a controversial technology in the aerospace industry, where commercial manufacturers are the only source for procurement.

Congressional District: 2

Congressional Representative: Mark Pocan

Dane Count's Teen Newspaper

Simpson Street Free Press

Simpson Street Free Press

James Kramer

WSGC Program: Special Initiatives

Advisor: Mandy Kroninger

Research Topic: Using Science to Bridge Achievement Gaps

Award: Special Initiatives; \$5000.00

Abstract: Simpson Street Free Press (SSFP) delivers high-quality academic instruction in after-school settings. Local students (ages 8-18) publish five separate youth newspapers. New academic standards emphasize writing proficiency and literacy. Productive use of out-of-school time is crucial, particularly for students from lower income backgrounds. Central to SSFP pedagogy is across the curriculum instructional practices. And science writing for publication is a central to our formula. Each of our newspapers includes several science sections, and space science is our most read and most popular content. SSFP lesson plans are expertly designed to support in-school learning. Students encounter predictable connections to the school day. Our young writers conduct research, use technology, write and read extensively. This system accomplishes multiple outcomes. Students learn transferable academic strategies. School grades and attendance are measured. SSFP students participate in civic discourse and influence their peers. Teachers use SSFP materials in local classrooms. Thousands of young readers and their families explore science through the work of SSFP student reporters. Young readers are inspired by the voices of southern Wisconsin's most effective and best-known local role models.

Congressional District: 2

Congressional Representative: Mark Pocan

Dane Count's Teen Newspaper

Simpson Street Free Press

Simpson Street Free Press

Taylor Kilgore, Mckenna Kohlenberg, James Kramer, Alex Lee, Robin Mwai, Ben Redderson

WSGC Program: Special Initiatives

Advisor: Mandy Kroninger

Research Topic: Using Science to Bridge Achievement Gaps

Award: Special Initiatives; \$5000.00

Abstract: Simpson Street Free Press (SSFP) delivers high-quality academic instruction in after-school settings. Local students (ages 8-18) publish five separate youth newspapers. New academic standards emphasize writing proficiency and literacy. Productive use of out-of-school time is crucial, particularly for students from lower income backgrounds. Central to SSFP pedagogy is across the curriculum instructional practices. And science writing for publication is a central to our formula. Each of our newspapers includes several science sections, and space science is our most read and most popular content. SSFP lesson plans are expertly designed to support in-school learning. Students encounter predictable connections to the school day. Our young writers conduct research, use technology, write and read extensively. This system accomplishes multiple outcomes. Students learn transferable academic strategies. School grades and attendance are measured. SSFP students participate in civic discourse and influence their peers. Teachers use SSFP materials in local classrooms. Thousands of young readers and their families explore science through the work of SSFP student reporters. Young readers are inspired by the voices of southern Wisconsin's most effective and best-known local role models.

Congressional District: 2

Congressional Representative: Mark Pocan



University of Wisconsin-Madison

Sean DuBois

Status: Sophomore, Environment and Resources

Advisor: Dr. Ankur Desai

Research Topic: Assessment of Ecosystem Photosynthetic Parameters Along Two California Climate Gradients

Award: Dr. Laurel Salton Clark Memorial Graduate Fellowship; \$5000.00

Abstract: Improving coupled Earth system models of current and future climate requires robust observations that accurately provide parameters and observations for evaluation across spatial scales relevant for the model. Photosynthetic parameters V_{cmax} and J_{max} help to characterize the ability of vegetation to assimilate carbon, a required parameter in most land surface modules of climate models. Remote sensing, flux tower data, and field measurements were collected to develop a methodology to estimate the variability in these parameters across diverse landscapes in Southern California and the Sierras, regions experiencing prolonged drought which is expected to become more common in the future. V_{cmax} maps were generated with NASA hyperspectral airborne AVIRIS imagery by scaling up leaf level measurements to the canopy and evaluated using flux tower data for nine sites across California. These maps illustrate the expected temporal and spatial changes in the parameter. However, V_{cmax} estimated from inverse modeling of flux tower data did not fall in the range found in field measurements. The methods developed in this study expand the applicability of imaging spectroscopy in estimating ecosystem metabolism.

Congressional District: 2

Congressional Representative: Mark Pocan



University of Wisconsin-Madison

Brian Harvey

Status: Graduate, Junior, Zoology

Advisor: Dr. Monica G. Turner

Research Topic: Burn Me Twice, Shame on Who? Testing for Wildfire Feedbacks in Forests of the US Northern Rocky Mountains

Award: Dr. Laurel Salton Clark Memorial Graduate Fellowship; \$5000.00

Abstract: Understanding the complex responses of forested landscapes to changing fire regimes is critical for predicting land-cover patterns under a warming climate. Using decades of existing NASA satellite imagery and extensive field-calibration data on burn severity I tested whether successive forest fires in the Northern Rocky Mountains interact through feedbacks, and identified factors that are more likely to lead to two successive high-severity (stand-replacing) fires. Feedbacks among wildfires depended on forest type and interval between the first and second fire. Feedbacks in wildfire severity shifted from negative to positive with increasing elevation and with interval between two fires. Areas characterized by two successive stand-replacing fires were in subalpine forests at higher elevations, shallower slopes, and northeasterly aspects where the interval between fires was longer. Further analyses are underway, and results will identify when and where fire-catalyzed shifts in vegetation are occurring or are likely to occur with continued climate change and altered fire regimes.

Congressional District: 2

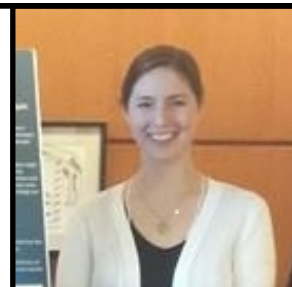
Congressional Representative: Mark Pocan

Madeline Lambert

Status: Junior, Physics

Advisor: Dr. Eric Barnes

Research Topic: The Elijah Project – 2014 High Altitude Balloon Project



Award: Student Satellite; \$4000.00

Abstract: The purpose of this paper is to discuss the development and findings of the experiments performed on the high altitude balloon payload. After some bonding time in the beginning of the summer, the team got together and decided on the four following experiments: Atmospheric Electric Field, Breakdown Voltage, IR Imaging, and Solar Efficiency/Payload Spin. Subsequently, research and fabrication began which involved learning new skills such as Arduino programming, 3-D modeling, foam cutting, and more. The launch was successful, and the results retrieved were more or less what were expected. This internship opportunity proved to be an amazing learning experience for the team which will be valued for each of their future career experiences.

Biography: I was born and raised in Germantown, Wisconsin. I have always had a deep love of learning; from the moment I could read, I began trying to learn all I could, about science especially, and have continued that endeavor to this very day. I am currently attending the University of Wisconsin La Crosse, and working toward a Physics major with Mathematics and Computer Science minors. The Elijah Project was my first experience with research - hopefully the first of many. At my college, I am involved with the Physics club as well as choir. I hope to obtain a Master's degree in either electrical or aerospace engineering, get my pilot's license, and ideally work for NASA.

Congressional District: 3

Congressional Representative: Ron Kind



Kickapoo Valley Reserve

John Heasley

WSGC Program: Aerospace Outreach

Research Topic: Driftless Dark Skies Initiative: Training Astronomy Educators

Award: Outreach; \$3800.00

Abstract: The Driftless Dark Skies Initiative is training and supporting a cohort of a dozen astronomy educators who make use of the unique resources of the Kickapoo Valley Reserve to inspire and inform school groups and the public about the night sky and space exploration by offering nature programs and public star parties.

Congressional District: 3

Congressional Representative: Ron Kind

Colin Egerer

Status: Junior, Physics/Mathematics

Advisor: Dr. Eric Barnes

Research Topic: Clarifying the Role of Thermodynamics in Self-gravitating Dark matter Systems

Award: Undergraduate Research; \$3500.00

Abstract: Astrophysicists currently favor the idea that the vast majority of mass in the universe exists in a collisionless form that interacts only through gravity. This paradigm has been successful in allowing computer simulations of cosmological volumes to reproduce structures similar to those observed. Our work aims to better understand the physics at work in collisionless systems, in general. Specifically, we investigate how well thermodynamics-based approaches to understanding equilibrium structures agree with results of computer simulations. Using a suite of N-body simulations with differing initial conditions, we examine the density and velocity profiles of self-gravitating collisionless systems. Statistical comparisons between simulated equilibrium structures and two thermodynamics-based models indicate the relative appropriateness of the models. We find that no single model can describe systems resulting from the entire range of initial conditions investigated here. Our major result is that these thermodynamics-based models can successfully reproduce equilibria that arise in gently evolving systems. However, the failure of thermodynamics-based models to describe the equilibria of more violent evolutions suggests that they must retain some memory of their initial conditions.

Congressional District: 3

Congressional Representative: Ron Kind

Tyler Laszczkowski

Status: Junior, Astronomy/Physics

Advisor: Dr. Shauna Sallmen

Research Topic: Expanding Our Knowledge of Interstellar Neutral Hydrogen Shells

Award: Undergraduate Research; \$3500.00

Abstract: The purpose of this research is to increase the number of Galactic neutral hydrogen (HI) shells available for study. By identifying and studying more HI shells at various stages of their evolution, we can start to fill the gap in our understanding of the interactions of structures in the interstellar medium. This project consisted of visually identifying new HI Shells using 21-cm data downloaded from the GALFA-HI online database. This survey has higher angular resolution than the data used in previous searches, allowing us to discover smaller features. The results include a new list of previously undiscovered shell-like HI features along with measurements of their basic properties: location, mean angular diameter, shape, signs of expansion. Upon completing the search of 1/7th of the data cubes containing complete GALFA data, 141 potential shells were discovered. Additionally, one pattern appeared several times while identifying potential shells. This pattern can be described as a “figure-eight” feature composed of two features that are likely related. The completion of this project has expanded the current database of potential HI Shells in our galaxy, which can be used to provide important data in regards to the study of shell evolution and the role of shells within the ISM.

Congressional District: 3

Congressional Representative: Ron Kind

Dr. Shelly Leshner

WSGC Program: Special Initiatives

Research Topic: Promoting Women in Physics and Astronomy through a Distinguished Lecture Series

Award: Special Initiatives; \$2759.50

Abstract: Undergraduate women in the Physics Department at UW- La Crosse form a small percentage of majors and are spread out across years and among sub-programs. In addition, they may encounter few women scientist during their undergraduate career. As a result, they can feel isolated and uncertain about careers in their chosen fields. A women speaker was brought to UW – La Crosse to serve as a role model for undergraduate women in the physics program and to expose them to career opportunities in a space-related field. The speaker gave an interdisciplinary science seminar, a physics specific lecture, and met with students over lunch in small group discussion. Student feedback was very positive, and the visit increased the exposure to the different careers women, and all students, could have in science.

Congressional District: 3

Congressional Representative: Ron Kind



University of Wisconsin-Platteville

Trent Cybela

Status: Junior, Mechanical Engineering

Advisor: Todd Treichel

Research Topic: Equipping the Commercial Spaceflight Industry for Fighting Fire in Micro-Gravity

Award: Research Infrastructure; \$18,000.00 (Internship)

Abstract: For several years, Orbital Technologies (ORBITEC) has had keen interest in the development of a portable fire suppression system intended for use in commercial spaceflight applications. With the aid of recent developments in fine water mist (FWM) atomization technologies, and partnerships with the University of Wisconsin – Platteville, work is commencing to develop a portable fire extinguisher (PFE). The extinguisher will be capable of operation in both gravity and microgravity environments regardless of orientation, and eliminate the use of toxic carbon dioxide as a fluid suppressant. The extinguisher will take advantage of the unique physics of microgravity to better suppress fires compared to previously used equipment. The following report outlines baseline research into the historical precedence of spacecraft fires, and common modes of fire ignition in microgravity. From this information we investigate design considerations necessary for the construction of a prototype PFE, as well as the market value of such a device.

Congressional District: 3

Congressional Representative: Ron Kind



University of Wisconsin-Platteville

Trent Cybela

Status: Junior, Mechanical Engineering

Advisor: Duane Foust

Research Topic: Collegiate Rocket Competition - Pioneer Rocketry

Award: Student Satellite; \$4000.00

Abstract: The objective of the 2014 Wisconsin Space Grant Consortium (WSGC) Collegiate Rocket Competition was to design a one-stage high-powered rocket that could accurately reach an apogee of 3,000 feet and then be recovered timely and safely and in a flyable condition. The competition also required two methods of determining velocity through the use of onboard electronics. Overall, the performance in the 2014 WSGC Collegiate Rocketry Competition was a success. The rocket used for competition, Pioneer - I, reached an apogee of 3094 feet. The time took to recover the rocket was approximately ten minutes. The apogee reached and recovery time, combined with our presentation, design report, post-flight report, and educational outreach services put us into first place for this year's competition.

Congressional District: 3

Congressional Representative: Ron Kind



University of Wisconsin-Platteville

Jacob Ellenberger

Status: Sophomore, Mechanical Engineering

Advisor: Duane Foust

Research Topic: Collegiate Rocket Competition - Pioneer Rocketry

Award: Student Satellite; \$5000.00 (Team)

Abstract: The objective of the 2014 Wisconsin Space Grant Consortium (WSGC) Collegiate Rocket Competition was to design a one-stage high-powered rocket that could accurately reach an apogee of 3,000 feet and then be recovered timely and safely and in a flyable condition. The competition also required two methods of determining velocity through the use of onboard electronics. Overall, the performance in the 2014 WSGC Collegiate Rocketry Competition was a success. The rocket used for competition, Pioneer - I, reached an apogee of 3094 feet. The time took to recover the rocket was approximately ten minutes. The apogee reached and recovery time, combined with our presentation, design report, post-flight report, and educational outreach services put us into first place for this year's competition.

Congressional District: 3

Congressional Representative: Ron Kind



University of Wisconsin-Platteville

Andrew Heindl

Status: Senior, Electrical Engineering

Advisor: Duane Foust

Research Topic: Collegiate Rocket Competition - Pioneer Rocketry

Award: Student Satellite; \$5000.00 (Team)

Abstract: The objective of the 2014 Wisconsin Space Grant Consortium (WSGC) Collegiate Rocket Competition was to design a one-stage high-powered rocket that could accurately reach an apogee of 3,000 feet and then be recovered timely and safely and in a flyable condition. The competition also required two methods of determining velocity through the use of onboard electronics. Overall, the performance in the 2014 WSGC Collegiate Rocketry Competition was a success. The rocket used for competition, Pioneer - I, reached an apogee of 3094 feet. The time took to recover the rocket was approximately ten minutes. The apogee reached and recovery time, combined with our presentation, design report, post-flight report, and educational outreach services put us into first place for this year's competition.

Congressional District: 3

Congressional Representative: Ron Kind



University of Wisconsin-Platteville

Luke Sackash

Status: Senior, Electrical Engineering/Engineering Physics

Advisor: Duane Foust

Research Topic: Collegiate Rocket Competition - Pioneer Rocketry

Award: Student Satellite; \$5000.00 (Team)

Abstract: The objective of the 2014 Wisconsin Space Grant Consortium (WSGC) Collegiate Rocket Competition was to design a one-stage high-powered rocket that could accurately reach an apogee of 3,000 feet and then be recovered timely and safely and in a flyable condition. The competition also required two methods of determining velocity through the use of onboard electronics. Overall, the performance in the 2014 WSGC Collegiate Rocketry Competition was a success. The rocket used for competition, Pioneer - I, reached an apogee of 3094 feet. The time took to recover the rocket was approximately ten minutes. The apogee reached and recovery time, combined with our presentation, design report, post-flight report, and educational outreach services put us into first place for this year's competition.

Congressional District: 3

Congressional Representative: Ron Kind



University of Wisconsin-Platteville

Maria Smiles

Status: Senior, Engineering Physics

Advisor: Duane Foust

Research Topic: Collegiate Rocket Competition - Pioneer Rocketry

Award: Student Satellite; \$5000.00 (Team)

Abstract: The objective of the 2014 Wisconsin Space Grant Consortium (WSGC) Collegiate Rocket Competition was to design a one-stage high-powered rocket that could accurately reach an apogee of 3,000 feet and then be recovered timely and safely and in a flyable condition. The competition also required two methods of determining velocity through the use of onboard electronics. Overall, the performance in the 2014 WSGC Collegiate Rocketry Competition was a success. The rocket used for competition, Pioneer - I, reached an apogee of 3094 feet. The time took to recover the rocket was approximately ten minutes. The apogee reached and recovery time, combined with our presentation, design report, post-flight report, and educational outreach services put us into first place for this year's competition.

Congressional District: 3

Congressional Representative: Ron Kind

Michael Wiznitzer

Status: Sophomore, Mechanical Engineering

Advisor: Willaim Farrow

Research Topic: The Elijah Project – 2014 High Altitude Balloon Project



Award: Student Satellite; \$4000.00

Abstract: The purpose of this paper is to discuss the development and findings of the experiments performed on the high altitude balloon payload. After some bonding time in the beginning of the summer, the team got together and decided on the four following experiments: Atmospheric Electric Field, Breakdown Voltage, IR Imaging, and Solar Efficiency/Payload Spin. Subsequently, research and fabrication began which involved learning new skills such as Arduino programming, 3-D modeling, foam cutting, and more. The launch was successful, and the results retrieved were more or less what were expected. This internship opportunity proved to be an amazing learning experience for the team which will be valued for each of their future career experiences.

Biography: Born in 1994 to a budding world of fast improving technology, curiosity of how it all worked became a passion for me. Inventions and creative ideas populated my mind to the point that when I was a little kid, I was creating all kinds of structures out of Lego and Kinex for fun. One thing led to another, and soon I was putting together household items like bookcases, and fixing broken items even as complex as ovens. Math and science, of course, became a big part of my life and participating in several science programs over the years has further increased my interest, particularly in the aerospace field. There was no question that engineering was the way to go. As a mechanical engineering student at the Milwaukee School of Engineering, I have gained many technical skills (among others) which I have had the good fortune to apply in many projects involving CAD, programming, and design in general. Just this past summer (2014) in fact, I interned as part of the WSGC Elijah High Altitude Balloon Payload Team where we all designed and launched a payload filled with 5 different experiments to 100,000 feet! Even now, I'm on a rocket design team that's part of the WSGC collegiate rocket competition because it's awesome and I get to do some actual rocket science! Give it another few years, and I hope to be working in the aerospace industry full time!

Congressional District: 4

Congressional Representative: Gwen Moore

David Helminiak

Status: Sophomore, Computer Engineering

Advisor: Dr. John Borg

Research Topic: Simulations of Granular Material Motion

Award: Undergraduate Research; \$3500.00

Abstract: A simulation study utilizing Hooke style particle models was conducted to better understand the characteristic modes, translational/rotational energy distribution, the complete energy cascade and applications of granular interactions occurring within a horizontal drum tumbler. This study was conducted in conjunction with a physical study performed by Nathaniel Helminiak, entitled: "Experiments with Granular Material Motion for Extraterrestrial Applications." These simulations were created through the discrete element modeling software: LIGGGHTS (LAMMPS Improved for General Granular and Granular Heat Transfer Simulations) and the program it is based upon, LAMMPS (Large-scale Atomic/Molecular Massively Parallel Simulator). The resulting flows were visualized within VisIt visualization software and analyzed using the high-level computer language, GNU Octave. Simulations predicted areas of interest to study and extend tests beyond the physical test bed's material limitations. The study suggests the existing idea of force chains as applied to rotational forces, namely "bro-chains," and also that the industry mass finishing process may benefit from investigation into a complete energy characterization of granular flow.

Congressional District: 4

Congressional Representative: Gwen Moore



Marquette University

Nathaniel Helminiak

Status: Sophomore, Mechanical Engineering

Advisor: Dr. John Borg

Research Topic: Experiments with Granular Material Motion

Award: Undergraduate Research; \$3500.00

Abstract: In this study, a horizontal drum tumbler, filled at variable depths with spherical media, was rotated at constant speeds. An exposed monoplane layer of aggregate was photographed with a high-speed camera, in order to perform a particle tracking velocimetry (PTV) algorithm followed by image registering. The algorithms extracted both the translational and rotational velocities. To our knowledge, this is the first reported experimental measurement of rotational velocities in a rotary drum tumbler with granular media. The objective of this study, companioned with David Helminiak's "Simulations with Granular Material Motion for Extraterrestrial Applications", sought to measure the induced rotational velocity of individual grains and characterize the distribution of energy, both translational and rotational. The study not only proposes an addition to the existing idea of force chains, namely rotational "Bro-chains", but also suggests that within industry, mass finishing can benefit from complete energy characterization.

Congressional District: 4

Congressional Representative: Gwen Moore



Milwaukee School of Engineering

Eric Johnson

Status: Junior, Mechanical Engineering

Advisor: Dr. Matt Anderson

Research Topic: Collegiate Rocket Competition - Team Whoosh Generator

Award: Student Satellite; \$1000.00

Abstract: The objective of the 2014 Wisconsin Space Grant Consortium (WSGC) Collegiate Rocket Competition is to design, build, and fly a single-stage, high-powered rocket to accurately reach an apogee of 3000 feet, along with design restrictions and two added design objectives. The rocket must use a motor as specified by WSGC, have a maximum length of 72 inches, have a body tube diameter between 4 and 6 inches, use a flight data recorder provided by WSGC, and be safely recovered in a flyable condition by an electronically deployed parachute system. Also, a system in addition to the altimeters already on board must be implemented that records data which can be used to find the rocket's velocity and acceleration during ascent. Finally, the time to rocket recovery must be minimized.

Congressional District: 4

Congressional Representative: Gwen Moore



Milwaukee School of Engineering

Daniel Ochoa

Status: Junior, Mechanical Engineering

Advisor: Dr. William Farrow

Research Topic: The Elijah Project – 2014 High Altitude Balloon Project

Award: Student Satellite; \$4000.00

Abstract: The purpose of this paper is to discuss the development and findings of the experiments performed on the high altitude balloon payload. After some bonding time in the beginning of the summer, the team got together and decided on the four following experiments: Atmospheric Electric Field, Breakdown Voltage, IR Imaging, and Solar Efficiency/Payload Spin. Subsequently, research and fabrication began which involved learning new skills such as Arduino programming, 3-D modeling, foam cutting, and more. The launch was successful, and the results retrieved were more or less what were expected. This internship opportunity proved to be an amazing learning experience for the team which will be valued for each of their future career experiences.

Congressional District: 4

Congressional Representative: Gwen Moore



Milwaukee School of Engineering

Leeta Russell

Status: Sophomore, Mechanical Engineering

Advisor: Dr. Matt Anderson

Research Topic: Collegiate Rocket Competition - Team Whoosh Generator

Award: Student Satellite; \$4000.00

Abstract: The objective of the 2014 Wisconsin Space Grant Consortium (WSGC) Collegiate Rocket Competition is to design, build, and fly a single-stage, high-powered rocket to accurately reach an apogee of 3000 feet, along with design restrictions and two added design objectives. The rocket must use a motor as specified by WSGC, have a maximum length of 72 inches, have a body tube diameter between 4 and 6 inches, use a flight data recorder provided by WSGC, and be safely recovered in a flyable condition by an electronically deployed parachute system. Also, a system in addition to the altimeters already on board must be implemented that records data which can be used to find the rocket's velocity and acceleration during ascent. Finally, the time to rocket recovery must be minimized.

Congressional District: 4

Congressional Representative: Gwen Moore



Milwaukee School of Engineering

Evan Schilling

Status: Junior, Electrical Engineering/Computer Engineering

Advisor: Dr. William Farrow

Research Topic: The Elijah Project – 2014 High Altitude Balloon Project

Award: Student Satellite; \$4000.00

Abstract: The purpose of this paper is to discuss the development and findings of the experiments performed on the high altitude balloon payload. After some bonding time in the beginning of the summer, the team got together and decided on the four following experiments: Atmospheric Electric Field, Breakdown Voltage, IR Imaging, and Solar Efficiency/Payload Spin. Subsequently, research and fabrication began which involved learning new skills such as Arduino programming, 3-D modeling, foam cutting, and more. The launch was successful, and the results retrieved were more or less what were expected. This internship opportunity proved to be an amazing learning experience for the team which will be valued for each of their future career experiences.

Congressional District: 4

Congressional Representative: Gwen Moore



University of Wisconsin-Milwaukee

Sydney Chamberlin

Status: Junior, Physics/Astrophysics

Advisor: Dr. Jolien Creighton

Research Topic: Black Holes, Lasers and Data Analysis: Contributions to Gravitational Wave Searches with the ExcessPower Pipeline

Award: Graduate Fellowship; \$5000.00

Abstract: Gravitational waves (GWs) are tiny perturbations to the spacetime structure of the universe that propagate freely as wavelike solutions to the Einstein equations. The direct detection of GWs is currently a major goal in experimental physics, and a number of large scale efforts to detect them are currently underway.

Congressional District: 4

Congressional Representative: Gwen Moore



University of Wisconsin-Milwaukee

Michael Stefik

Status: Sophomore, Mechanical Engineering

Advisor: Dan Beller

Research Topic: The Elijah Project – 2014 High Altitude Balloon Project

Award: Student Satellite; Launch, \$4000.00/Payload, \$4000.00

Abstract: The purpose of this paper is to discuss the development and findings of the experiments performed on the high altitude balloon payload. After some bonding time in the beginning of the summer, the team got together and decided on the four following experiments: Atmospheric Electric Field, Breakdown Voltage, IR Imaging, and Solar Efficiency/Payload Spin. Subsequently, research and fabrication began which involved learning new skills such as Arduino programming, 3-D modeling, foam cutting, and more. The launch was successful, and the results retrieved were more or less what were expected. This internship opportunity proved to be an amazing learning experience for the team which will be valued for each of their future career experiences.

Congressional District: 4

Congressional Representative: Gwen Moore



University of Wisconsin-Milwaukee

Madeline Wade

Status: Senior, Physics

Advisor: Dr. Jolien Creighton

Research Topic: Searching for Gravitational Waves from Sub-Solar Mass Black Holes

Award: Graduate Fellowship; \$5000.00

Abstract: We are searching for gravitational-wave signals from sub-solar mass black hole binary systems in initial Laser Interferometer Gravitational-wave Observatory (LIGO) data. The most likely candidates for such systems are primordial black holes that have formed from the collapse of quantum fluctuations in the early universe. Primordial black holes have not yet been ruled out by microlensing experiments, but the allowable masses have been restricted. The gravitational-wave strain from such an inspiralling binary system is well modeled with the post-Newtonian formalism. Therefore, a modeled search for gravitational-wave signals is employed. The search technique is known as matched filtering and is implemented using a codebase that is well-suited for fast searches with long signals. One of the biggest challenges in performing this search is dealing with the heavy computational burden. The gravitational-wave signals from such low-mass binary systems are long (about 10 minutes) and require a large number of models, or templates, spread across the parameter space. A large effort has been focused on speeding up the search while using a reasonable amount of computational resources.

Congressional District: 4

Congressional Representative: Gwen Moore

Jalal Nawash

WSGC Program: Research Infrastructure

Research Topic: A study on Select Solar Cell's Voltage Output at High Altitudes Using a Weather Balloon



Award: Research Infrastructure; \$4976.00

Abstract: The Voltage output of select solar cells was monitored as a function of altitude up to approximately 93,000 feet. A weather balloon was used to carry the solar cells to the required altitude. Two launches were accomplished to acquire data for analysis. Data collected also included the altitude, temperature and pressure. The voltage signal of the used solar cells depended largely on temperature. It was discovered that the voltage signal of the solar cells has a complex relationship with altitude. Temperature had a significant influence on the magnitude of the voltage signal at lower altitudes, but this influence may have declined at higher altitudes.

Biography: I was born in Amman, Jordan where I went to high school. I Received a B.Sc. in Physics in 1993, and then a M.Sc. in solid-state physics in 1997, I worked as a high school teacher for 3 years, then I came to the United States in 1999. The year after, I received a MA in Physics. I joined the doctoral program in Materials Engineering at Washington State University in 2001. My research focus was crystal growth of optoelectronic materials. I graduated in 2007. I worked at Gonzaga University for two years as a physics faculty, then I came to University of Wisconsin-Whitewater (UWW) in 2009 as tenure track faculty in the physics department.

My interest in NASA research through WSGC came after I was working on solar cells in my lab at UWW. I was wondering how the efficiency of these solar cells change at high altitudes. I looked for answers on line and in the scientific literature, but I could not find a convincing answer, so I decided to conduct the experiment with the help of my undergraduate students. I applied for a grant with WSGC and they funded our idea. We are very grateful for their grant, which helped answer some of our questions. The results of our research were published during 24th Annual Wisconsin Space Conference, "Commercial Space" and it is available on line.

Congressional District: 5

Congressional Representative: James Sensenbrenner Jr.

Daryl Johnson

Status: Junior, Geography

Advisor: Dr. Rex Hanger

Research Topic: Size differences of the post-anoxia, biotic recovery brachiopod, *Dyoros* sp., in Hughes Creek Shale (Carboniferous), Richardson County, Nebraska.

Award: Undergraduate Scholarship; \$1500.00

Abstract: Two localities of the Carboniferous Hughes Creek Shale in southeastern Nebraska contain both fossiliferous limestones and shales, as well as black shales interpreted as being deposited under anoxic conditions in ancient oceans. Fossils within strata above the anoxic layers represent life that had recovered from a local killing event. Examining the killing/recovery patterns on expanded, regional scales is made difficult due to the relative lack of good exposures between outcrops. Previous miscorrelations have occurred for the Hughes Creek Shale in two established collecting localities separated by only a few kilometers. Specimens of the brachiopod fossil, *Dyoros* sp., abundant at both localities were compared using the size frequency distributions of their length measurements. Null hypotheses of the equality of the medians and equality of the overall distributions were not able to be rejected, adding support to the current accepted interpretation of correlation for the two localities, allowing for future use of both for examining killing/recovery of life on expanded geographic scale.

Congressional District: 5

Congressional Representative: James Sensenbrenner Jr.



Ripon College

Jadee Kellogg

Status: Junior, Physics/Mechanical Engineering

Advisor: Dr. Leah Simon

Research Topic: The Elijah Project – 2014 High Altitude Balloon Project



Award: Student Satellite; \$4000.00

Abstract: The purpose of this paper is to discuss the development and findings of the experiments performed on the high altitude balloon payload. After some bonding time in the beginning of the summer, the team got together and decided on the four following experiments: Atmospheric Electric Field, Breakdown Voltage, IR Imaging, and Solar Efficiency/Payload Spin. Subsequently, research and fabrication began which involved learning new skills such as Arduino programming, 3-D modeling, foam cutting, and more. The launch was successful, and the results retrieved were more or less what were expected. This internship opportunity proved to be an amazing learning experience for the team which will be valued for each of their future career experiences.

Biography: I have lived in a small town in southeastern Wisconsin all my life. In elementary school and high school I excelled in Mathematics and Science. While looking up careers in this field, I came upon Engineering. Since then, I have been set on getting a degree in Mechanical or Aerospace Engineering. However, I decided to attend undergraduate school at Ripon College in Wisconsin to get a solid background in Physics and Mathematics before moving on to graduate school to obtain an engineering degree. In the summer of 2014, I was fortunate to be awarded an internship opportunity working on the Elijah Project with the Wisconsin Space Grant Consortium where I helped to design, construct, and fly a scientific payload in a near-space environment using a high altitude balloon. Since then, I have been focusing on my studies as well as actively searching for more opportunities in the aerospace industry.

Congressional District: 6

Congressional Representative: Glenn Grothman



Spaceport Sheboygan

Daniel Bateman

WSGC Program: STEM

Research Topic: Rocket Science for Educators Using Rocket Design and Simulation Software

Award: Outreach; \$2500.00

Abstract: The Wisconsin AIAA chapter has leveraged the talent of its members to provide a variety of outreach opportunities for precollege aged students. Hands-on demonstrations, visual aids, and real-life space flight examples provide a foundation for bringing precollege aged students face-to-face with space-related science, designed hardware, technology, and potential benefits; increased interest in aerospace and space related fields that lead to study at the university level followed by career. The Rocket Science for Educators program consists of a workshop used to assist schools in implementing rocket science into respective math or science curriculums. Grant assistance provided by the Wisconsin Space Grant Consortium (WSGC) makes this workshop possible. In 2014 Spaceport Sheboygan teamed with AIAA for a training event where participating educators attended a weekend workshop and received design software training and associated set of rocket science materials that they may take back to their respective schools.

Congressional District: 6

Congressional Representative: Glenn Grothman



University of Wisconsin-Sheboygan

Aaron Jarosh

Status: Sophomore, Elementary Education

Research Topic: Collegiate Rocket Competition – The Flight of the Wombat 1

Advisor: Dr. Swapnil Tripathi

Award: \$2000.00 (Team)

Abstract: The Wisconsin Space Grant Consortium (WSGC), 2014 Collegiate Rocket Competition was comprised essentially of several connected objectives. These objectives included the design and build of a one-stage, high-powered rocket. This rocket needed to satisfy the objective of an accurate apogee of 3000 feet. In addition to the apogee requirement, teams also needed to quickly recover their rocket after flight in “flyable condition”. This entailed a timely and safe recovery system to be designed for the rocket, which was then tested by the actual timed recovery connected event following the competition flight of the rocket, thus determining the accuracy and usability of the system. The final component of the competition involved the rocket to have two methods in which to determine the rocket’s velocity.

Our team, of 3 students and several mentors of varying involvement, designed a rocket, built the rocket and then tested it. Many hours were spent in research, learning and building were followed by recording data, researching areas to make adjustments for apogee and recovery accuracy and then creating a presentation and compiling post flight data reports. As an outreach portion of the competition requirements, a presentations to other UW College classes was delivered to help increase interest into space programs of this nature.

Congressional District: 6

Congressional Representative: Glenn Grothman



University of Wisconsin-Sheboygan

Christine Sutherland

Status:

Research Topic: Collegiate Rocket Competition – The Flight of the Wombat 1

Advisor: Dr. Swapnil Tripathi

Award: \$2000.00 (Team)

Abstract: The Wisconsin Space Grant Consortium (WSGC), 2014 Collegiate Rocket Competition was comprised essentially of several connected objectives. These objectives included the design and build of a one-stage, high-powered rocket. This rocket needed to satisfy the objective of an accurate apogee of 3000 feet. In addition to the apogee requirement, teams also needed to quickly recover their rocket after flight in “flyable condition”. This entailed a timely and safe recovery system to be designed for the rocket, which was then tested by the actual timed recovery connected event following the competition flight of the rocket, thus determining the accuracy and usability of the system. The final component of the competition involved the rocket to have two methods in which to determine the rocket’s velocity.

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Congressional District: 6

Congressional Representative: Glenn Grothman



University of Wisconsin-Sheboygan

Grace Zeit

Status: Junior, Physics/Astronomy

Research Topic: Collegiate Rocket Competition – The Flight of the Wombat 1

Advisor: Dr. Swapnil Tripathi

Award: \$2000.00 (Team)

Abstract: The Wisconsin Space Grant Consortium (WSGC), 2014 Collegiate Rocket Competition was comprised essentially of several connected objectives. These objectives included the design and build of a one-stage, high-powered rocket. This rocket needed to satisfy the objective of an accurate apogee of 3000 feet. In addition to the apogee requirement, teams also needed to quickly recover their rocket after flight in “flyable condition”. This entailed a timely and safe recovery system to be designed for the rocket, which was then tested by the actual timed recovery connected event following the competition flight of the rocket, thus determining the accuracy and usability of the system. The final component of the competition involved the rocket to have two methods in which to determine the rocket’s velocity.

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Congressional District: 6

Congressional Representative: Glenn Grothman



LAWRENCE UNIVERSITY

Lawrence University

Dr. Jeff Clark

WSGC Program: Higher Education

Research Topic: "Hands-on" Remote Sensing of Physical Models in Exploration of Surficial Processes



Abstract: The goal of this work is to create an interactive, data-rich learning environment that will enhance student understanding of remote sensing principles and surficial processes. In service of this goal a data acquisition system consisting of common consumer electronics (e.g. a digital camera and Microsoft Kinect) was used to monitor temporal and spatial changes in a scale model of a fluvial setting. Analysis of these data allows students to track landform evolution in response to changing inputs and boundary conditions. These scale-model observations of surficial processes can be also compared to full-scale planetary landscapes.

Biography: Professor of Geology Jeffrey Clark received his undergraduate degree at Middlebury College where he double majored in geology and environmental studies. He came to Lawrence University in 1998 with a degree in geography and environmental engineering from Johns Hopkins University. Dr. Clark's research focuses on the anthropogenic impact on river systems. He has evaluated the role of dams changing sediment storage dynamics and the impact of land use on channel morphology. He spent a year as a visiting scientist at the NSF-Funded National Center for Earth Surface Dynamics where he investigated the role of bed composition and morphology on hyporheic flow. In the classroom, Dr. Clark's pedagogical approach is to establish a relevant and stimulating learning environment through the innovative use of technology to enhance hands-on activities and field experiences. He has written on the use of "field-computers" in the outdoor classroom and more recently has turned his attention to the use of physical models to demonstrate earth processes at greatly condensed spatial and temporal scales, which the WSGC funding supported.

Award: Higher Education; \$8000.00

Congressional District: 8

Congressional Representative: Reid Ribble



Crossroads at Big Creek, Inc.

Coggin Heeringa

WSGC Program: Education Outreach and Special Initiatives

Research Topic: Teaching Teachers from Standards to Lessons

Award: Outreach; \$1000.00

Abstract: Funds from Wisconsin Space Grant Consortium were used to provide scholarship stipends to upper elementary and middle school teachers, enabling them to take a continuing education class through the University of Wisconsin-Green Bay Education Outreach Program and/or participate in workshops sponsored by Crossroads at Big Creek. The objective of the class and workshops was to help teachers gain content knowledge and develop lessons aligned with the proposed Next Generation Science Standards.

Congressional District: 8

Congressional Representative: Reid Ribble