



## West Virginia Space Grant Consortium – Proposal #1

Dr. Majid Jaridi

### **WV Space Grant/Community and Technical College Collaboration**

According to the National Skills Coalition, middle-skills jobs, which require more than a high school education but not a four-year degree, account for 43% of jobs today (62 million) and will continue to account for the largest portion of jobs into the next decade. The Community and Technical College System (CTCS) of West Virginia seeks to address those needs through offerings at its nine colleges on 24 campuses.

Over 4000 certificates and degrees were awarded in the West Virginia system in 2011-12, representing a nearly 40% overall increase since 2008. The system has placed specific emphasis in three emerging regional needs:

- advanced manufacturing,
- energy, and
- information technology.

Most of the content/course development needs for those three areas of emphasis will be met through a recently awarded \$25 M grant from the Department of Labor. This three-year program began in October 2013 and seeks to leverage existing capabilities within the state.

Capitalizing on and enhancing the Department of Labor grant will be the general approach for the proposed grant, with the majority of NASA funding targeting the three identified areas and providing:

- Internships for CTC students, primarily at local/regional STEM-related businesses and industries;
- Summer fellowships for CTC faculty at local/regional STEM-related businesses and industries and/or at NASA Field Centers; and
- Special projects, such as a collaborative payload-building project, that partner CTC students with students and/or faculty at four-year institutions.



Massachusetts Space Grant Consortium– Proposal #2

Dr. Jeffrey Hoffman

### **MA Space Grant Pilot Program in Aviation Maintenance and Aeronautics Technology at Cape Cod Community College (CCCC)**

The Massachusetts Space Grant Consortium (MASGC) proposes a partnership with the Cape Cod Community College (CCCC), with support from the Massachusetts Department of Transportation and Cape Air/Jet Blue Airlines, to assist in the establishment and accreditation of an Aeronautics Technology and Aviation Maintenance (ATAM) Program at CCCC. The proposed program addresses the needs both of the Commonwealth and the entire New England region for qualified technicians and mechanics in the aviation industry. MASGC will provide funding for students in addition to helping to develop the program. This program also addresses one of NASA's avowed priorities, as stated by NASA's Aeronautics Research Mission Directorate (ARMD), to solve the challenges that exist in our nation's air transportation system and will add to NASA ARMD's goals of contributing to "solutions to benefit the flying public every day".



Washington Space Grant Consortium– Proposal #3

Prof. Robert Winglee

### **A Coordinated Approach to Authentic, Hands-On STEM Experiences at Two-Year Institutions in Washington**

Washington NASA Space Grant Consortium (WSGC) is a statewide organization funded by NASA as a Designated Program, with additional funds provided by state and private sources. We accomplish our goals and objectives through the activities of the lead institution, 13 member institutions, and seven industry and educational partners.

Participants in this proposal are a subset of WSGC members and partners. They are the University of Washington (the lead institution), Central Washington University, Northwest Indian College, Edmonds Community College, Everett Community College, and Seattle Central College and North Seattle College, both community college campuses within the Seattle Colleges district.

The proposed work will create a coordinated approach to recruiting and retaining community college students in science, technology, engineering and math (STEM) majors that can be replicated at the state's other two-year institutions. This will be achieved through mentoring, authentic research experiences, and capstone projects. Our goal will be to support at least 40% women and 17% underrepresented minorities in their progress to earn their STEM degrees. These targets are consistent with higher education enrollment for the state. The work will also build sustaining infrastructure at the participating community colleges by training instructors to lead rocket and balloon launch initiatives and by providing the resources needed to be successful.

These objectives will be achieved through the following three techniques:

- 1) Community college students preparing for a major in a STEM degree will receive support through scholarships, peer mentoring and the opportunity to participate in a rigorous research experience, either at one of the participating four-year universities, at an industry partner, or at a NASA center,

- 2) Knowledge acquired in creating successful high-powered rocket and high-altitude balloon programs at WSGC member schools will be used to create a rocketry program within the Seattle Community College district and a high-altitude balloon program at Everett Community College. Additional support will be given to the rocketry program at Northwest Indian College to allow for growth of the program.
- 3) A course materials repository will support the expansion of the successful introductory survey course, Space and Space Travel, into community colleges as technique to expose students who are still choosing a major to the excitement of the NASA-themed careers.

Mentoring and recruitment activities will focus on supporting students non-traditional to STEM (women and underrepresented minorities) and do so in a manner that is proven to produce a high retention rate. The research training and hands-on learning through the capstone projects will create members of a future workforce capable of leading and innovating in STEM. The survey courses will advance the STEM knowledge of nonmajors and create an early recruiting tool for nontraditional students who might not otherwise be considering a STEM major.

The proposed work would address the state's skills gap which is identified in the Kauffman Foundation New Economy Index of Leaders of Innovation. Washington ranks second only to Michigan in the percentage of our workforce that are engineers; however, among the states, we are also the largest per-capita importer of college-degree professionals. The proposed work also addresses the NASA Office of Education Performance Goals for diversity of students and institutions (2.4.1 and 2.4.3), delivery of NASA content and professional development for educators (2.4.2) and continued opportunities for students to participate in STEM encouragement activities that capitalize on NASA's unique assets and content (2.4.5).



New Jersey Space Grant Consortium– Proposal #4

Dr. Haim Baruh

### **New Jersey Space Grant Consortium Community College Support**

This proposal is concerned with developing support programs for recruitment and retention in STEM topics in New Jersey community colleges. The main goals are to promote interest in STEM topics in community colleges, to ensure that STEM students remain engaged and interested in STEM, to reduce the number of students who leave STEM as their major, to increase enrollment in STEM, and to help community college STEM students enroll in four-year colleges upon graduation.

The proposal is in response to the solicitation by the MASA Office of Education entitled: Competitive Opportunity for Partnerships with Community Colleges and Technical Schools (2014-2016), announcement number NNH14ZHA003C.

A total of nine different, but intertwined, activities are proposed, including STEM boot camps, scholarships, support for female students, sending students and faculty to NASA centers, experiential learning, annual STEM educator conference, and outreach activities. The proposed work involves dissemination of NASA content and resources to community colleges and it is designed to stimulate interest in and obtain participation from female students and underrepresented minorities.

The proposal brings together New Jersey community colleges in a synergistic way. It introduces NASA content and resources to community college students, it provides trips to NASA centers, and familiarizes both students and faculty at community colleges with NASA, encouraging them to take advantage of NASA's unique resources for STEM education.



New York Space Grant Consortium– Proposal #5

Prof. Yervant Terzian

### **New York Space Grant Community College Partnership Program**

We intend initiating a Community College (CC) Science, Technology, Engineering, and Mathematics (STEM) Partnership Program for New York State to increase the number of CC students completing their degrees and/or transferring to four-year colleges. To this end, our objectives are: 1) to retain as well as attract CC students by engaging them in and appropriately training them for research in areas relevant to NASA; 2) instituting a one-semester Methods of Science Research (MSR) course to help CC students build the required competencies to undertake this research; 3) increase CC educators' abilities to engage students in research and deliver NASA STEM content through workshops on developing and running local MSR courses, with appropriate release time from their very high teaching loads for mentoring students; 4) help students build a sense of belonging in NASA-related STEM fields by facilitating summer research experiences at NASA Centers and our other STEM partners, including four-year NYSG affiliates and associated industry partners.

This program will directly address the following NASA Education and solicitation objectives: a) attract/retain more CC students into STEM-based academic programs; b) increase CC educators' ability to deliver NASA STEM content; e) increase the number of students that complete their two-year Associate's degree from a CC and obtain employment in a STEM career; and f) increase the number of CC STEM graduates and transfers into four-year institutions.



North Carolina Space Grant Consortium– Proposal #6

Dr. Christopher Brown

## **Strengthening the NC Space Grant Partnership with the NC Community College System to Enhance STEM-based Learning**

The National Aeronautics and Space Administration (NASA) Office of Education has issued a Cooperative Agreement Notice to the National Space Grant College and Fellowship Program (Space Grant) entitled, Competitive Opportunity for Partnerships with Community Colleges and Technical Schools. The purpose of this opportunity is to engage community college and technical school faculty and undergraduate students enrolled in science, technology, engineering and math (STEM) degree programs. Each funded proposal is expected to increase the understanding, assessment, development, and utilization of space and aeronautics resources, as well as promote partnerships and cooperation among NASA Centers, universities, federal, state and local governments, and aerospace industries to facilitate the application of institutional resources to aerospace and related fields. The North Carolina Space Grant will implement two primary activities to meet the purpose of this opportunity: (ACTIVITY 1) Competitive Student Scholarships - NC Space Grant will support community college students through competitive scholarships in order to attract and retain students tracked to graduate and/or matriculate into 4-year universities during the grant period of performance. With direct support to students through competitive scholarships activity, the NC Space Grant will increase both the funding level and number of recipients of Space Grant scholarships at community colleges thereby attracting and retaining more students into STEM-based academic programs. As part of their application, students will demonstrate in their academic coursework and an essay how their studies relate to NASA areas of research; (ACTIVITY 2) Team Design Challenge and Competition - NC Space Grant will develop a team design challenge and competition to engage faculty and students from community colleges across the state. This activity will allow NC Space Grant to increase the exposure, understanding, development and assessment of aeronautics resources among learning communities of faculty and students, as well as build partnerships and cooperation among NASA Centers, universities, the public sector, and aviation and aerospace industries. This approach also introduces faculty and students to opportunities to participate in NASA's many competitions and challenges. NC Space Grant will conduct educator professional

development (EPD) workshops to expose faculty to ballooning, competition, and NASA STEM content. Faculty will then adapt and transfer skills and techniques from the workshop to their local community college. Throughout the academic year, student teams will learn NASA's design cycle, launch readiness review, and how to conduct post-launch evaluation reviews. At the end of the academic year, teams that complete critical design and build phases will launch their payloads at a balloon launch and retrieval team competition. Student teams will compete for recognition in categories including: best payload, best documentation, highest flight, best outreach, and best picture. NC Space Grant will convene a panel of judges from NC Space Grant affiliate universities, aerospace companies, and NASA as critical phase reviewers and judges. This will also serve to bridge NASA and aerospace stakeholders to community college faculty and students. Activities proposed will contribute to Co-STEM Priorities, the objectives of the National Space Grant College and Fellowship Program, NASA's Office of Education Lines of Business and FY2104-FY2015 Annual Performance Goals, and North Carolina Space Grant's Strategic Plan.



South Dakota Space Grant Consortium– Proposal #7

Dr. Edward Duke

### **A Sustainable Food Chain: Growing the Right Stuff!**

The state of South Dakota has no community college system, but there are four technical institutes, one of which is a long-time affiliate of the South Dakota Space Grant Consortium (SDSGC). Under this opportunity for Partnerships with Community Colleges and Technical Schools, SDSGC affiliate Lake Area Technical Institute (LATI) will lead a two-year effort to advance interaction between technical institutes and NASA and to elevate the role of technical institutes within the consortium, potentially leading to additional technical institute partnerships in the state. Major emphasis will be directed toward attracting more female and Native American students into STEM programs at technical institutes. These goals are in direct response to the Cooperative Agreement Notice and national CoSTEM priorities. The principle fields of study that will benefit from this project are Aviation, Agri-Aviation, Environmental Technology, and Robotics. The identified fields have clear relevance within the NASA Mission Directorates and align well with recently formalized South Dakota research and development priorities and industry target sectors. Growth in these fields of study will also open new pathways for technical school graduates to transfer into related programs at the state's four-year research universities. Major funding will be directed to student scholarships, NASA Johnson Space Center internships, participation in the Community College Aerospace Scholars program, and on-site research internships. The main partners in this effort will be LATI, the SDSGC management team, South Dakota State University (SDSU), Johnson Space Center, and an independent organization that specializes in STEM curriculum development, recruitment of underrepresented minorities, and program evaluation. LATI and SDSU have a successful record of collaboration in aviation and will expand the collaboration into development of UAV-based remote sensing systems that will benefit long-standing NASA research programs at SDSU as well as the state's agriculture industry.



Utah Space Grant Consortium– Proposal #8

Dr. Joseph Orr

### **Partnerships in Utah with Community Colleges and Technical Schools**

As NASA engagement in science and engineering initiatives continues to evolve, the need for a highly competent and highly diverse workforce remains. STEM education provides a foundation for this workforce. In this proposal, Snow College will provide encouragement in traditional STEM fields, and Salt Lake Community College and Utah College of Applied Technology will capture another important area for STEM education. This alternative aspect of STEM, an area particularly relevant to the national community college landscape, is the opportunity provided by engineering technology programs. Since engineering technology programs bridge the spectrum from hourly applied technology certificates all the way to advanced graduate degrees, Salt Lake Community College (SLCC) and Utah College of Applied Technology (UCAT) are poised to provide an accessible and qualified educational opportunity that maximizes the likelihood of success for the students that enter these programs. This proposal seeks to influence students entering college from High School statewide through a Student Science Summer Camp, hosted by Snow College, offering particular emphases in rural areas of Utah, and to increase the strength of the SLCC Engineering Technology and UCAT Engineering Technology participation by offering scholarship opportunities. This proposal, in addition, seeks to strengthen the SLCC Engineering Technology courses by embedding additional aerospace and NASA content into the SLCC Engineering Technology curriculum, and by creating a new composites engineering technology emphasis to provide further connection with the Utah aerospace landscape.



Colorado Space Grant Consortium– Proposal #9

Mr. Chris Koehler

### **Colorado Space Grant Consortium Community College Extension**

Through the Colorado Community College Extension (CCCE) effort, COSGC proposes to add 4 new community college campuses to the COSGC membership and to expand NASA resources across the state by engaging a larger number of students in hands-on, real-world STEM projects. The effort will engage a minimum of 40 additional community college students and 8 community college faculty in COSGC programs. Participating students will design, build, and launch high altitude balloon payloads. Participating students will have the opportunity to compete for scholarships, participation in summer internships at NASA Centers, and participation in the RockOn! Workshop at NASA's Wallops Flight Facility. COSGC will integrate new campuses into the Consortium using the established DemoSat model beginning with a how-to workshop and then establishing balloon payload programs on said campuses - in addition to providing access to all statewide COSGC hands-on programs and resources. The proposed effort aligns well with NASA Office of Education Goals by facilitating inclusive student projects that represent the diversity of the institutions on which they are facilitated; providing opportunities for post-secondary students at community colleges to engage in real-world, hands-on, STEM projects that capitalize on NASA unique assets and content; and brings the statewide COSGC program closer to fully representing the diversity of institution types in the state of Colorado by increasing the number of community colleges engaged as COSGC affiliates to 9 of the 16 higher education affiliated institutions.



New Mexico Space Grant Consortium– Proposal #10

Dr. Patricia Hynes

## **COMMUNITY COLLEGE TECHNICAL SCHOOLS (CCTS) STUDENT LAUNCH PROGRAM**

Detailed program & project description: The purpose of this program is to develop strong & meaningful collaborations community colleges & technical schools in New Mexico. The goals of this proposal are to: 1) attract/retain more community college & technical college students into STEM based academic programs 2) increase the number of transfers from community college & technical college STEM graduates & into four-year institutions 3) create a skill ready workforce for NASA & the nation 4) use NASA & State of New Mexico resources coupled with hands on experience, to assure students & faculty are well versed in NASA's needs & aerospace related careers available in New Mexico. Our intent is also to enable increased undergraduate degree production & retention rates at these institutions by awarding up to 20 scholarships/year & involve 45 STEM students/year in the program. The CCTS Student Launch Program will provide the opportunity for both schools to develop space technologies that will be certified to fly from Spaceport America. Each school will be required to write proposals under NASA Flight Opportunities announcement. This requirement not only exposes students & faculty to NASA resources, it also provides a unique opportunity for participants to go through a flight qualifications process that only NASA can do. They will receive certificates indicating this achievement at the end of the launch campaign. They will also have a direct relationship with NASA Dryden & NASA Ames. Through the CCTS Student Launch Program students & faculty will design space technologies that use the environment of suborbital space to learn about the atmosphere, air quality, the dynamics of a rocket & ground procedures leading up to the launch. They will learn how to build space technologies, get them qualified by NASA, & in the process discover how to answer scientific & engineering questions not only about space but also about the technologies they will be using in space.



Texas Space Grant Consortium– Proposal #11

Dr. Wallace Fowler

## **C2 STEM Transitions**

Description: Community College STEM Transitions (C2 STEM Transitions) will utilize a variety of activities with community colleges in the Texas Space Grant Consortium (TSGC) to advance the nation’s Science, Technology, Engineering, and Mathematic (STEM) workforce pipeline by engaging students, teachers and faculty in NASA’s missions and unique assets. Activities will include STEM scholarships, experiential learning opportunities, student success initiatives and course development. The included activities are designed to attract/retain more community college students into STEM-based academic programs.

Key Objectives: a) assure that students participating in NASA higher education projects are representative of the diversity of the Nation; b) continue to support STEM educators through the delivery of NASA education content and engagement in educator professional development opportunities; c) assure that the institutions NASA engages with represent the diversity of institution types and category levels in the Nation as defined by the US Department of Education; d) continue to provide opportunities for learners to engage in STEM education through NASA unique content provided to informal education institutions designed to inspire and educate the public; and e) continue to provide opportunities for learners to engage in STEM education engagement activities that capitalize on NASA unique assets and content.

Significance to NASA: In the 2014 release of its Strategic Plan, NASA has reinforced the commitment to advancing the nation’s STEM education and workforce pipeline by engaging students, teachers and faculty in NASA’s missions and unique assets. This proposal furthers this goal by leveraging resources and utilizing existing infrastructure so that more of the funding can involve and impact Texas community college students. The intent of the activities included in this proposal contributes to both the goal of the White House Summit on Community Colleges and the Co-STEM priority areas of enhancing STEM experience of undergraduate students and understanding that students from various backgrounds may comprise high enrollment in community colleges.



Virginia Space Grant Consortium– Proposal #12

Ms. Mary Sandy

### **STEM Takes Flight at Virginia's Community Colleges**

In partnership with the Virginia Community College System, a Consortium member, and with strong support of the Virginia Governor's office, and in collaboration with NASA Langley Research Center and NASA Wallops Flight Facility, VSGC proposes a suite of programs for Virginia community college students and faculty statewide. STEM Takes Flight for Virginia's Community Colleges offers the following program elements: community college bridge scholarships; research experiences at NASA Langley Research Center and NASA Wallops Flight Facility; industry internships through the VSGC-managed Commonwealth STEM Industry Internship Program; faculty professional development at NASA Wallops; a new course-based student service learning experience at NASA Langley; and two new courses around a student flight project, Rocksat-C. Some proposed elements build on existing VSGC programs and all build on VSGC's extensive experience in working with faculty and students on STEM initiatives. In total the project elements provide 63 significant student awards, NASA site-based professional development for 20 faculty, and new self-sustaining courses that will impact at least 39 additional students in their first offering. STEM Takes Flight program goals are: 1) To foster enhanced community college retention in STEM academic tracks through graduation or transfer to a four-year institution by: Providing coaching, mentoring, and financial support for STEM majors in their freshman and sophomore years. (15 Community College Bridge Scholarships); Providing paid mentored internships and guest researcher experiences at NASA and in industry settings. (48 student placements); Establishing new, self-sustaining, for-credit courses that engage STEM community college students in NASA-related flight experiences and/or offer real-world service learning experiences with NASA that can serve as models for course expansion in the VCCS system. (3 courses); and Providing NASA content-based professional development for community college STEM faculty. (20 faculty). 2) To strengthen VSGC's relationships with and build NASA linkages with/for Virginia's community colleges. Supporting objectives are to nurture diversity and to meet diversity goals of at least 40% female participation and at least 25% underrepresented minority participation; to pipeline students to STEM in their next academic and workplace steps; and to foster STEM career awareness and workplace skills. The 63 students

receiving significant awards will be longitudinally tracked to their next step, which may include employment or pursuit of a higher degree. VSGC will seek to achieve at least a 90% retention rate and a graduation, transfer, or post-graduation employment rate of at least 90% among significant award recipients. One hundred percent of faculty workshop participants will demonstrate inclusion of NASA content in their teaching. VSGC will document new relationship building among NASA, VSGC and community college faculty and students as part of its evaluation process.



## Oklahoma Space Grant Consortium– Proposal #13

Dr. Victoria Snowden

### **Project u r NASA**

Project u r NASA appeals to the tech-savvy, “texter generation” eager to find their niche in NASA-STEM careers. Using the increasingly successful u r (Undergraduate Research) model, community college students will actively engage in a dynamic program designed to prepare them for university transfer into traditionally low enrollment STEM majors.

#### Central Objectives

The overarching goal of u r NASA is to improve STEM education at TCC and Redlands through its innovative NASA Challenges curriculum. The project will increase diversity of faculty and student participants, leverage NASA resources and personnel to provide internships at NASA Centers, assist faculty curriculum development, and provide faculty professional development opportunities at NASA Centers.

TCC and Redlands propose an innovative, team-based, work-force relevant project designed to recruit, retain, and increase the number of students who complete a technical degree in STEM disciplines at 2-year community colleges and/or transfer to 4-year university STEM programs. Oklahoma’s submission incorporates new NASA focused curricular and course development to build STEM education capabilities and attract and retain more community college students in STEM-based academic programs. The project will also create or enhance strategic relationships between the awarded institution and NASA Centers and other industry STEM partners. The educational experiences and partnerships will increase students’ opportunities to obtain employment in a STEM careers.

#### Methods/Techniques proposed to accomplish stated objectives

The strengths of Redlands and TCC will be harnessed through partnerships with: NASA Oklahoma Space Grant Consortium, (OSGC), Jet Propulsion Laboratory (JPL), United States Department of Agriculture (USDA)-Agricultural Research Station (ARS), Tulsa Alliance for Engineering, and Hardesty Center for Fab Lab Tulsa.

Utilizing existing STEM opportunities and resources at these entities, the project team designed the program to address the three primary areas that contribute to STEM student attrition: 1) not feeling a part of the campus climate, 2) academic difficulty, and 3) financial challenge.

Students will participate in program orientation and tour experiences, internships, classroom inquiry-based learning, and job shadows with faculty, industry professionals and research scientists. Faculty will be given release time to provide mentorship, implement Design Challenge curriculum, and assist students in internships with research partners. In addition, students and faculty will travel to NASA Centers to gain hands-on experience.

Significance of the proposed work

Eighty percent of Project u r NASA participants will continue to pursue a STEM discipline which is an increase of 33% above the current average rate for the state of Oklahoma of 47%. All of the students in the project will be teamed with STEM mentors representing academia, industry, and research centers. Mentorship opportunities will result in an increase of at least 36 graduates which is 70% above the current average graduation rate of 20%. Additionally, 50% of internships will be with industry professionals looking to hire project graduates for full-time STEM employment opportunities upon university graduation. Partnerships will continue to grow, as the total number of academic relationships will double by continued participation in OSGC annual meetings and program opportunities. The total number of industry relationships will be tripled by networking with the Tulsa Engineering Alliance and the Oklahoma Department of Commerce.

The net impact Project u r NASA will be to attract, retain, graduate, transfer, and employ more STEM graduates state-wide by improving educational opportunities, providing bridging opportunities to OSGC four-year universities, and building partnerships with industry leaders.



Vermont Space Grant Consortium– Proposal #14

Prof. Darren Hitt

## **Enhancement of the Aviation Technology Program at Burlington Technical Center**

Aircraft maintenance technicians perform a critical function within the United States aviation industry. Aviation technicians holding certification in Airframe & Powerplant Systems are responsible for inspecting the entire aircraft and ensuring that repairs and maintenance are performed with the highest standards. They also conduct detailed inspections between takeoffs and landings and address issues identified by pilots. In addition to the maintenance itself, aircraft technicians are required to fully document repairs and maintain all maintenance records of the aircraft they oversee.

The Burlington Technical Center (BTC) Aviation Technology Program, located in Burlington, Vermont, is a nationally recognized program that exceeds the federal requirements of Federal Aviation Regulations (FAR) part 147 under certificate number VMQT049K. It also holds the distinction of being the only school in New England able to train world-class technicians in both fixed wing and helicopter aircraft and boasts a 100% job placement rate for its graduates. This two-year program is designed to provide instruction in a wide variety of skill areas related to the aviation technology field. These areas include basic aircraft maintenance, principles of aerodynamics, flight electronics, troubleshooting, drawing, metallurgy, physics of flight, and trends and careers in the aviation industry.

Burlington Technical Center is well poised to undertake a significant step forward to expand its overall program in terms of size, curriculum and degree offering. The goal of this proposal is to undertake a series of activities that will assist BTC in moving forward with this initiative that, in time, will provide a valuable contribution to the aviation technology workforce within the United States. The specific initiatives of this project will be three-fold. First, a significant portion of the program budget will be used for scholarships that will enable the existing program to roughly double in size. This increase in program enrollment will be leveraged to expand BTC program faculty. Second, faculty collaborators at the University of Vermont will provide enhancements to the existing aerodynamics curriculum at BTC

through a combination of hands-on experimental modules including aerodynamic measurements, computer-based design, and rapid prototyping. Finally, a business faculty at St. Michael's College with expertise in management science will partner with BTC to move forward a curricular initiative for BTC students involving Aviation Maintenance Management.



Minnesota Space Grant Consortium– Proposal #15

Dr. William Garrard

## **MN Space Grant Community College**

### **Quadrotor Design Competition**

This program is designed to (1) increase the number of community college students who graduate with STEM degrees and/or transfer to STEM programs at four year institutions, (2) increase the ability of community college faculty members to deliver aerospace-related content in areas of interest to NASA, and (3) enhance the diversity of students pursuing STEM education at Minnesota community colleges. These objectives will be accomplished by the use of small model helicopters (quadrotors) in competitions between student design groups at five Minnesota community colleges. These design groups will be led by faculty advisors at the various community colleges. The design competitions will consist of having the students build and then modify commercially-available quadrotor kits to incorporate additional electronics and sensors required to perform a mission in which the quadrotor is required to fly to a specified location, collect data related to a simulated precision-farming or environmental-science task, and return with the data. The students will be required to analyze the data and provide written and oral reports of their results.

Each year seven student teams of five students will participate, each advised by a community college faculty member. Thus over the two-year period of the program, fourteen teams (a total of seventy students) and seven or more community college faculty advisers will participate. The community colleges participating in the program are in different locations in Minnesota, in order to provide geographic diversity. Community college partners include Central Lakes College in Brainerd (North Central MN), Century College in White Bear Lake (Minneapolis/St Paul Metro Area), Fond du Lac Tribal and Community College which is a MnSGC affiliate located in Cloquet (North East MN), Minnesota West Community and Technical College in Worthington (South Western MN), and Itasca Community College in Itasca (North Central MN). The University of Minnesota Twin Cities will serve as lead institution.

Quadrotors will be used for the competition because quadrotor kits are readily available, experience has shown that compared to fixed-wing radio-controlled airplanes students can quickly learn to pilot quadrotors, and quadrotors can be operated in small spaces (including indoors) with no infrastructure, which is not the case with fixed-wing radio controlled airplanes. Each student team will start by building and learning to fly a basic quadrotor from a commercially-available kit (each team will use the same brand of kit for uniformity). Experience has shown that building a quadrotor from scratch would take too long for an inexperienced team and there would be no guarantee that each team would have a flyable vehicle in the end. Instead, students will significantly modify their kits in order to mount sensors, actuators, and electronics necessary for the competition challenges. This will also involve some mechanical design and fabrication, giving the students experience with computer-aided design (CAD) software and 3-D printing. In addition, the students will have to learn microcontroller programming and integration of electronics, sensors, actuators, and data-logging to ensure that they function properly.



Ohio Space Grant Consortium– Proposal #16

Prof. Gary Slater

## **CC-STARS! (Community College-STEM Training and Retention of Students!) - A Proposal from the Ohio Space Grant Consortium**

Key, Central Objectives - The Ohio Space Grant Consortium (OSGC) is proposing a creative and innovative program to encourage and increase the number of community college and technical school (CC-TS) students engaged in NASA-oriented STEM education and skills. The proposed program is focused on 3 specific tasks which all contribute to this goal: 1) A scholarship program directed towards CC-TS students enrolled in a STEM program, and an accompanying research experience. We will support a minimum of 40 students, and through aggressive recruiting we will attempt to reach a population including 20% underrepresented minorities, and 40% female students. 2) A project-oriented program to encourage the participation of a larger number of non-scholarship students. Such a program has shown to be effective for retention and recruitment and is designed to appeal to the "hands-on proclivity" of the typical CC-TS student. The primary project will be a competitive opportunity to develop, build, and fly an unmanned aircraft system (UAS) culminating in a competition with other schools in the program at an annual competition. This program is to be modeled on a previously funded OSGC program at Lorain County Community College and at several of our 4-year affiliates. Because some schools do not have an aeronautics focus, a second optional program is one focused on space and astronomy. This will be modeled and expanded on a successful program currently in existence at Lakeland Community College. Both these programs are important to the NASA mission and will be led by current community college faculty. 3) A "Bridge/Mentoring" program that will encourage STEM retention and mentor students who wish to transition from the 2-year associate degree program to a 4-year engineering/technology degree. This is primarily done at the community college where a variety of social and technical activities are designed to retain students in STEM and encourage transition to a 4-year program. The 4-year schools have a part here, too, in welcoming and providing an appropriate social and technical environment for the transfer student. Key elements include: 1) Welcoming STEM Students through sponsored orientation sessions; 2) Providing students with descriptive, written information on policies and procedures, faculty members and program offerings; 3) Providing training to

sensitize support staff to goals for creating an environment that welcomes and affirms each STEM Scholar; 4) Providing ongoing support to STEM students through the academic year, including one-on-one mentoring with a faculty member as well as career exploration opportunities. Methods/Techniques Proposed to Accomplish the Stated Research Objectives - Key personnel and a structured timeline are in place to accomplish the stated goals of the program both at the participating community colleges and at the 4-year schools. All activities have been demonstrated to be effective in retention by prior OSGC programs and also by programs at our participating schools. Significance of the Proposed Work to the Objectives of the Solicitation and to NASA Interests and Programs in General - Through these proposed programs, the OSGC will engage community college STEM students in Ohio with the goal of leading them into a STEM-based career. In addition, the program develops a significant interaction with NASA and the NASA Glenn Research Center promoting the NASA mission. The program will attract diverse students, including a goal of 20% underrepresented minorities and 40% women and/or persons with disabilities to NASA-related careers in STEM. In addition, the programs will contribute to President Obama's White House Summit on Community Colleges to increase the number of community college graduates by 5 million by 2020, and also contributes to two CO-STEM priority areas: 1) Enhance STEM experience of undergraduate students; 2) Better serve groups historically underrepresented in STEM fields.



Florida Space Grant Consortium– Proposal #17

Dr. Jaydeep Mukherjee

## **NASA Olympionics**

The NASA Olympionics program will recruit students from Florida Community Colleges and engage them in a STEM Education program focused on simplified versions of NASA's traditional challenges/projects targeted at four year universities. This concept is based on evidence found in a study by Brandeis University which concludes that the FIRST Robotics Competition has resulted in an increased number of students matriculating into STEM degrees at higher education institutions. It is also based on results identified by the US Naval Academy which identifies how their Cyber Weekend Competition, modeled after the National Security Agency's Cyber Defense Competition, has directly led to significant increases in students enrolling into its Computer Science Department.

The NASA Olympionics program will culminate in students traveling to Kennedy Space Center Visitor Complex to participate in an "Olympic" style event in which they will compete on teams in three different technical challenges. These challenges are modeled after NASA 's University Student Launch Initiative, the Robotic Mining Competition, and the Reduced Gravity Flight Program. Students from Florida Keys Community College (FKCC), Hillsborough Community College (HCC), and North Florida Community College (NFCC) will be invited to participate in this program.

Thirty students each year, represented by ten students from each Community College, will be selected through a competitive online application process. These ten students will be divided into two teams at each school. Each team will be provided with instructional materials, parts, and materials necessary to compete in each of the three challenges. The teams will meet on a weekly basis during the Spring semester to build, test, and refine their entries. A STEM faculty member has been assigned by each school to serve as an advisor to the teams. In addition, guidance will be provided by a subject matter expert who will conduct videoconferences and webinars on each challenge. This subject matter expert will also provide telephone and email support in response to help sought from advisors and team leaders.

It is estimated that students will spend approximately five weeks preparing for each challenge. After the spring semester concludes, students will travel to the Kennedy Space Center Visitor Complex in the summer to compete in the Olympionics, where each event will be scored on specific metrics. The program will be repeated a second year. Thus, a total of 60 students will be served.

Students who are accepted and who complete the program, will be awarded a \$5,000 scholarship. They, along with other community college students, will also be invited to participate in a NASA Virtual Opportunity Fair. The fair shall be held online and provide students with the ability to meet one-on-one via webcam with representatives from universities and colleges, as well as NASA Centers and STEM industry employers regarding internships.

The overarching concept of Olympionics is aligned to the objectives of this solicitation and to NASA interests and programs in general by creating a pipeline to matriculate students from two-year community colleges into STEM majors at four year universities. This will be accomplished by (a) involving these students in simplified versions of NASA challenges/projects so that they are aware, inspired by, and are better prepared to compete in the full versions at four year universities, (b) using virtual technology to connect students with STEM programs at universities and four-year colleges who participate in these challenges, and (c) using virtual technology to connect students to internship opportunities at NASA and space industry contractors that are involved in the research and development of the technologies associated with these challenges.



Maine Space Grant Consortium– Proposal #18

Dr. Terry Shehata

### **Engaging Maine Community Colleges in the Maine Space Grant Community.**

The mission of the Maine Space Grant Consortium (MSGC), a 501(c)(3) organization, is to improve our Affiliates research infrastructure in areas of mutual interest to NASA and Maine; encourage more students to consider careers in fields of science, technology, engineering, and mathematics (STEM); and enhance NASA's presence throughout Maine. Through our Affiliates we achieve our mission by competitively awarding scholarships and fellowships to STEM undergraduate and graduate students, and competitively fund projects in four national objectives: Research Infrastructure, Higher Education, Pre-College and Informal Science Education. The MSGC, Southern Maine Community College (SMCC) and York County Community College (YCCC) propose to evaluate a cohort model in which a group of first-year SMCC and YCCC students receive performance-based scholarships and internships from their first year to graduation at the end of their second year, and participate in courses and activities infused with NASA contents and materials. Our objectives by the end of the project period are to (a) increase from 0 to 41 the number of space grant supported community college students that complete their degrees on time and pursue aerospace science and technology careers; and to (b) increase from 0 to 12 the number of space-grant supported community college students that graduate and transfer to four-year institutions. To achieve these objectives, SMCC and YCCC will implement the following interconnected activities: (1) Three-semester scholarships for cohorts of first-year students at both colleges starting in their 2nd semester and continuing to their 4th semester contingent on academic progress; (2) STEM Scholars Program as a STEM Learning Community to widen YCCC students' horizons by introducing them to a wide spectrum of STEM research and scientific topics; (3) Research internships for students to experience research at Affiliates and NASA facilities; (4) Bridge scholarships for students that are admitted to four-year institutions to ease transition; (5) Infusion of NASA contents in SMCC's Oceanography Instrumentation and Capstone Research courses, and YCCC's Biology, Computer Technology and Microbiology courses; and (6) A Faculty Development Program to train STEM faculty from all Maine Community Colleges on how to infuse NASA contents in their courses. We estimate to impact 300 additional students through course infusion

with NASA contents. A primary goal of the evaluation is to test several hypotheses about the relationship between space grant investments using a cohort model and retention and graduation rates of community college students. Although these analyses provide snap shots, the results would inform us about the potential impact of future space grant investments in student cohorts at higher education institutions if the differences are significant in the positive direction. The results of the overall project including the evaluation will help determine how best to sustain successful activities with institutional investments and other resources including space grant. For SMCC, these activities serve as a framework for developing additional extended STEM programs within the Biological Sciences department over the next several years. YCCC's aim with these activities is to instill a sense of curiosity in their students about STEM topics, foster an appreciation for the breadth of STEM knowledge, build the confidence of their STEM students, and help them transfer to four-year institutions.



Nevada Space Grant Consortium– Proposal #19

Prof. Christian Fritsen

### **A Community College Partnership Creating a Community of Practice Model to Engage and Retain Minority Students**

A Community of Practice within the community colleges of Nevada (College of Southern Nevada, Great Basin College, Western Nevada College and Truckee Meadows Community College) will be established among students and researchers that is expected to increase both retention and graduation at these colleges. The students will be recruited from existing students who have shown some interest in a STEM discipline with the help of the Honors Program in Southern Nevada and with classroom visits at the northern and rural campuses. The students recruited into the program will receive scholarships and will work with faculty on STEM projects. They will work in laboratories, take field trips, listen to STEM presentations, participate in journal clubs and have weekly meetings where the community gets together. These meetings will also include video feeds from the other campuses for statewide integration. There will also be additional activities at these weekly meetings to aid students in academics and either transitioning to a university or a STEM career. Student outcomes will be tracked and measured to insure they are making good progress and the overall student data will be tracked by the Nevada NASA Space Grant office for reporting purposes. This proposal is expected to aid in producing more community college graduates as well as recruiting underrepresented minorities.



Wyoming Space Grant Consortium– Proposal #20

Dr. Paul Johnson

## **WYOMING NASA SPACE GRANT COMMUNITY COLLEGE REU:**

### **RESEARCH EXPERIENCE FOR COMMUNITY COLLEGE UNDERGRADUATES**

In Wyoming, only about 30% of first-time, full-time community college students will complete an associate's degree. Similarly, only about 30% of community college graduates will transfer to a four-year university to complete a bachelor's degree. In Wyoming, we need to develop new programs aimed at increasing student success in graduating from college, especially for students starting at the community college level. Additionally, research shows that fewer than 40% of students who begin their undergraduate career in a STEM major will complete a STEM degree. There are many reasons for this attrition, including uninspiring content and unwelcoming environments in the sciences. We plan to directly address these issues by providing an enriching and welcoming summer research experience for students who are just beginning their careers in STEM specifically first and second year undergraduate students at community colleges. We will target community college students underrepresented in the STEM fields who do not have access to summer research programs, as do students at four-year colleges. Through the proposed Wyoming NASA Space Grant Community College Research Experience for Undergraduates (WSGC CC-REU), we plan to provide several opportunities for students: 1) summer research experiences at the University of Wyoming (UW), 2) NASA Center summer internships at Johnson Space Center (JSC), 3) student participation in the Community College Aerospace Scholars Program at JSC, and 4) community building activities for students. Community college students will be placed into either a summer research fellowship at UW or a summer internship at NASA JSC, and have the opportunity to participate in the Community College Aerospace Scholars program at NASA JSC as well. A student symposium will be held at UW or one of the community colleges at the end of each summer to showcase student research and projects, and to allow for networking between students. Additional community building opportunities will be available for students during the summer, which may include video-conference events with NASA JSC, NASA speakers, outdoor recreation activities in Wyoming, and field trips to aerospace/science-based companies in nearby Colorado. First-year participants will

have the option of returning for the second year to continue in the program. The second-year program will include both returning and new students. All students participating in a summer research program will also have the opportunity to get involved in the Community College Aerospace Scholars Program at NASA JSC. Working with a research mentor, interacting with NASA scientists and engineers, and getting involved in hands-on, authentic research experiences will provide inspiration and knowledge to students just beginning their academic and professional careers. Additionally, providing mentors at UW for community college students will make the transition from a community college to a university environment much easier, as students will have already spent a summer at the university and will know other participants from the program. The WSGC has affiliates at each of the seven community colleges in Wyoming. These partnerships will facilitate recruitment of both community college and underrepresented students into the WSGC CC-REU program. In addition, students will have the opportunity to be placed at a NASA Center for the summer through our contacts at NASA Johnson Space Center.



Louisiana Space Grant Consortium– Proposal #21

Prof. John Wefel

### **Launching Louisiana Community College Students into STEM (LLCCSS)**

This pilot project utilizes the Louisiana Aerospace Catalyst Experiences for Students (LaACES) student balloon program as a model for establishing an interdisciplinary experiential program at two Louisiana community colleges for the purpose of 1) attracting and retaining students into STEM fields using a NASA aerospace theme, 2) providing students with practical skills in electronics, software, mechanical development and project management, and 3) assisting the community college to establish an integrated program that provides practical experiences across multiple disciplines for their students. Following a year of skill building and balloon payload development, the Community College students will join other LaACES teams to launch their instruments at the Columbia Scientific Balloon Facility in Palestine, Texas, supported by the NASA Balloon Program Office (BPO).

The Louisiana institutions involved in this pilot project include Louisiana State University (LSU) as lead institution, Baton Rouge Community College (BRCC), University of New Orleans (UNO), and Delgado Community College (DCC). The project PI will be John P. Wefel, Director of the Louisiana Space Grant Consortium assisted by T. Gregory Guzik (LSU Institution-PI), Kevin Stokes (UNO Institution-PI), Asoka Sekharan (BRCC Institution-PI), and Raymond Duplessis (DCC Institution-PI). We employ a mentoring model in which LSU personnel mentor the BRCC faculty and students while UNO personnel mentor the Delgado faculty and students, since there is geographical proximity between the mentoring pairs. Both groups will utilize the already developed student ballooning course as the basis for student involvement and learning. The goal is to develop a unique Community College approach that can be replicated in the future at additional Community and Technical College sites.



Kentucky Space Grant Consortium– Proposal #22

Suzanne Smith

### **Faculty Mentored Team Projects for Engaging and Retaining KCTCS Students in STEM Degree and Transfer Programs**

NASA Kentucky and the Bluegrass Community and Technical College (BCTC) are partnering to offer scholarships to STEM students, release time to STEM faculty and NASA inspired content to STEM courses in the Kentucky Community and Technical College System (KCTCS). Over 90,000 students are currently enrolled at the 16 KCTCS Colleges on more than 70 campuses across the state. As the lead institution for the Community and Technical Colleges (CTC) involved, BCTC coordinates the three program elements aligned with the goals of the NASA program solicitation: Team Projects, Content Integration and Professional Development. As a pilot program, these elements will be implemented at BCTC, Jefferson Community and Technical College, Hopkinsville Community College and Owensboro Community and Technical College, with plans to recruit additional faculty and colleges. NASA Kentucky will develop partnerships with CTC to expand Affiliate membership in the Consortium, promote NASA opportunities and increase interactions among Affiliates, industry and higher education.

NASA and the federal Committee on STEM Education recognize the need to increase STEM graduation rates at all levels of degree programs. Because many students begin their post-secondary education at a local community college, investing in CTC students has tremendous potential to retain them through graduation or transfer to a four-year institution. The proposed program elements will support 40-60 students over two years and 6-10 faculty who will incorporate NASA content beyond the initial investment. Proposed team project topics include biofuels, aviation, astronomy, information technology and coaching FIRST competition teams. The goals for the NASA Kentucky BCTC program are:

Goal 1: Attract, retain and graduate or transfer CTC students in STEM degree programs through engagement in team projects, scholarships of \$2500 per semester and faculty mentoring.

Goal 2: Increase use of NASA STEM content in CTC courses through release time to mentor team projects, explore NASA education resources and participate in professional development on team building and project management skills.

Goal 3: Create and enhance strategic relationships between NASA Kentucky and KCTCS by collaborating with BCTC on this multi-College program, piloting CTC team projects for next Space Grant award cycle and adding CTC Affiliates.

The proposal goals and program elements are based on best practices for increasing participation of female and underrepresented minority students in STEM disciplines including: long term programs with a mentor, peer support, financial support, challenging courses, institutional capacity building and improved physical infrastructure. Within the two year period of performance students are personally recruited to a team of 3-4 diverse students, supported on a semester basis with opportunity for renewal and working directly with a Faculty Mentor at least 80 hours/semester. Funds are available for project materials and supplies as well as travel to the annual KCTCS conference. Professional development and a conference presentation session will spread the word to the entire KCTCS community to facilitate broader inclusion of NASA content in courses, recruit new Affiliate Representatives and Institutions, promote NASA Kentucky programs and increase STEM collaborations. All of NASA Kentucky's programs set students and faculty on Pathways of Opportunities through multiple STEM experiences toward their career goals.



Arizona Space Grant Consortium– Proposal #23

Prof. Timothy Swindle

### **ASCENDING Further: Engaging More Students from Community Colleges in STEM Activities through expansion of the Arizona Space Grant Consortium ASCEND program**

One of the most effective vehicles for engagement of community college students in STEM activities in Arizona has been AZSGC's ASCEND (Aerospace STEM Challenges to Educate New Discoverers) statewide workforce development program, in which teams of students from affiliate schools, including community colleges, design, build, fly, operate, and analyze payloads launched on high altitude weather balloons. We propose to expand ASCEND in four ways. First, by increasing the number of balloon launches, we will be able to increase the number of community colleges participating. At the identified community colleges, we will build engineering or science courses around the ASCEND program, as has been done at the most successful of our current community college partners. Second, we will provide scholarships for community college participants, to enable financially-constrained students, many of whom are working more than one job while also taking classes, to take the time to work on ASCEND without having to suffer financial consequences. Third, we will provide activities to help the community college student participants make the transition to our partner four-year universities, both by involving them in appropriate activities on the university campuses while they are still at community college and by linking them with Space Grant student participants at the universities if they move on to there. Finally, at one remote tribal college, where we have been unable to develop a full team to participate in the normal ASCEND program, we will conduct a two-day workshop leading to a balloon launch with a simplified payload, to bring some of the excitement of the science and technology of a balloon experiment to students who would otherwise be unable to participate.



Mississippi Space Grant Consortium– Proposal #24

Prof. Peter Sukanek

### **Mississippi Space Grant Community College Partnership Program**

The Mississippi Space Grant Consortium proposes a suite of four programs with the objective of encouraging community college students to pursue careers in the science, technology, engineering and mathematics (STEM) fields. These programs will engage both students and faculty from the Consortium’s eight community college affiliates. Scholarships, internships and summer workshops will be made available to students to enable and encourage them to complete their associate’s degree in the STEM areas, and either to seek STEM employment upon completion of their degree or to encourage and inspire them to continue their studies at a four-year institution. In addition, community college faculty will be awarded summer fellowships to gain practical experience working either with NASA and NASA-contractor technicians on rocket test stands, or with university researchers on aerospace-related research projects. These faculty will then be able to return to their home institutions and share their experiences and new-found knowledge with current and future students, increasing both the NASA-related content of their courses and inspiring their students to pursue STEM careers. Finally, two hands-on workshops will be held allowing students from the community colleges to build a payload for and fly a high altitude balloon. This experience will provide students with an experience that clearly demonstrate the excitement and challenges of a STEM career.



Tennessee Space Grant Consortium– Proposal #25

Prof. Alvin Strauss

### **Tennessee Community College Space Grant Consortium**

The mission of the Tennessee Community College Space Grant Consortium (TCCSGC) will be to recruit more women and underrepresented groups into STEM-related Associate Degree and Certificate programs, to encourage and inspire students in the community colleges' Engineering Technology programs in general and robotics specifically, and to assist Engineering Technology students to persist and graduate with an Associate of Applied Science Degree or certificate in the student's chosen career.

The TCCSGC will consist of five Tennessee Board of Regents community colleges and the Tennessee Space Grant Consortium. The five community colleges are: Pellissippi State Community College in Knoxville (Knox County), Roane State Community College in Harriman (Roane County), Northeast State Community College in Blountville (Sullivan County), Cleveland State Community College in Cleveland (Bradley County), and Columbia State Community College in Columbia (Maury County). The Tennessee Space Grant Consortium is located at Vanderbilt University in Nashville (Davidson County).

The goals and objectives of the TCCSGC are in alignment with the Obama Administration and NASA's priorities to help maintain America's preeminence in aerospace science and technology, to enhance the STEM experience of undergraduate students, to better serve historically underrepresented groups in STEM fields, and to increase the number of students that graduate with STEM degrees. The TCCSGC goals and objectives also correspond to NASA's priority concerning Materials, Structures, Mechanical Systems, and Manufacturing: Technology Area 12.

The major goal of the TCCSGC is to:

1. Increase the number of women and underrepresented groups enrolled in STEM-related programs at the five TCCSGC community colleges by 10 percent over two years.

The objectives of the TCCSGC are:

1. To recruit women and/or underrepresented groups, including veterans, into STEMrelated career programs.
2. To encourage and inspire students in the TCCSGC community colleges' Engineering Technology programs in general and robotics specifically by providing exciting opportunities to discover their potential and influence their career choices.
3. To provide manufacturers with a diverse, qualified pool of Engineering Technicians.
4. To increase the number of 2+2 articulation agreements with Engineering programs at four-year colleges.



Alabama Space Grant Consortium– Proposal #26

Dr. John Gregory

### **ASCENT: Alabama Space Grant Community College Engineering Transfer program**

The Alabama Space Grant Consortium proposes to involve students at 3 Alabama Community Colleges and faculty at 2 Alabama 4-year universities. Faculty at all 5 institutions will be involved. The focus will be on retaining CC students in STEM tracks with the specific purpose of helping them graduate and/or transfer to a 4 year school with the goal of obtaining a degree in Engineering or Science. Modes we are exploring include: 1) A summer hands-on exploration of technology and engineering. The students will be enrolled at a Community College and participate in a “Foundations of (or Introduction to) Engineering” course that is taught by the university faculty at either site. The students would get academic credit for the class. 2) Senior community college students will participate in an undergraduate research experience that utilizes both University and Community College faculty as mentors. Facilities on both campuses will be utilized. The students will present their research at an event such as the HPCU-UP convention, which is held annually by AAAS. Again, the students will receive academic credit for the foundations course.



## Montana Space Grant Consortium– Proposal #27

Dr. Angela Des Jardins

### **Launching Culturally Relevant Montana Careers in STEM**

Launch will involve students and faculty from all 13 Montana community colleges (CCs). Seven of the 13 are Tribal Colleges (TCs); Montana has more TCs than any other state. Three of the 13 will be new, permanent members of the Consortium. Student participants will take part in impactful hands-on training that will lead to increased recruitment, retention and successful transition in two relevant and timely STEM areas. Faculty participants will receive technical training or support to incorporate related experiential learning into new or revised courses. In addition, Launch leverages new partnerships with Kiksapa Consulting, the IBM Academic Initiative, and Oracle Bozeman.

Montana Space Grant Consortium's (MTSGC) Launch program goals are to 1) kick-start thirty Montana CC students' careers in the culturally relevant and NASA-related fields of geospatial and computer technology and to 2) provide CC faculty the support necessary to increase long-lasting growth in recruiting and graduating students in geospatial and computer technology. By culturally relevant we mean training in fields of interest to Native American and rural Montana students as well as training in fields where graduates have potential for employment in their home communities.

The two broad fields identified for this CC opportunity are geospatial technology and computer technology. The majority of native and rural students are interested in education that will help them better their home communities. For example, the 2006 Institute for Higher Education Policy report for the American Indian College Fund states that "The degrees and fields of studies offered at TCUs are directly related to the needs of the reservation" such as health services, education, and rural farm and business development.

Not only are geospatial technology and computer technology culturally relevant, but they are also areas with demanding need for skilled workers. The US Department of Labor ranks geospatial technology as a high growth industry with an enormous increase in the demand for [people with] such skills. In computer technology, Code.org founder Hadi Partovi estimates that 1.4 million programming jobs will be

needed over the next decade while current projections are for only 400,000 graduates in the field.

In addition to being culturally relevant, both fields are prime gateways for Montana CC students to enter pipelines for NASA-related careers. During the Launch hands-on internships, students will purposely be exposed to NASA career options and experiences. From Earth remote-sensing applications, to programming, to information technology, NASA needs people trained in geographical and computer technology.

MTSGC will accomplish our Launch goal by engaging students in a semester+summer hands-on training program, repeated for a second group of students in the second half of the period of performance. Launch will also provide summer support opportunities for community college faculty.

An important component of Launch is student access to advisors and mentors. In geospatial technology, MTSGC will leverage the new partnership with Kiksapa Consulting as well as existing advisors at Salish Kootenai College (SKC). In computer technology, Launch will leverage the two additional new partnerships with IBM's Academic Initiative and Oracle Bozeman as well as leverage existing advisors at SKC and Missoula College (MC).

The proposed Launch program will create a long-term impact at Montana's community colleges, bringing in three new Consortium members; training and supporting dozens of students in culturally relevant, NASA-related, quickly growing areas; drawing on MTSGC strengths; creating new course content; and leveraging new partnerships with Montana technology companies.



Hawaii Space Grant Consortium– Proposal #28

Dr. Luke Flynn

### **Project Imua: Developing CubeSat Fabrication and Support Capacity at the University of Hawaii’s Community College Space Grant Consortium Partners**

Project Imua (to move forward in Hawaiian) proposes the establishment of a joint faculty-student enterprise for fabricating and testing payloads that will be launched by the Hawaii Space Flight Lab (HSFL) and other launch systems. This partnership will initially consist of four campuses within the University of Hawaii Community College (UHCC) system. Upon proof of concept, the remaining three UHCC campuses will be invited to join this partnership in order to promote wider student impact and enhance the enterprise’s sustainability. Project Imua will be supported by the main Space Grant campus at the UHawaii-Manoa, which will provide technical assistance through its HSFL resources and personnel. This joint venture is similar to the Hawaiian concept of ahupua‘a, a traditional subdivision of land from the mountain to the sea that relied upon the specialized skills of the communities residing along its span. Sustainability of the ahupua was achieved through the cooperation among its diverse labor force by sharing the products of their specialized practices. Similarly, each campus within this coalition brings its own expertise and skills that will be tapped and galvanized into a functioning structure for constructing and testing small satellite payloads. One campus will be assigned the task of designing and building the payload’s instrumentation. In close collaboration, a second campus will provide the payload’s electronic circuitry and software, while a third campus will design and manufacture the associated print circuit board. The fourth campus will conduct all static and flight testing of the payload. The Imua coalition will empower its members to move forward by enhancing their skills and expanding the STEM-based learning opportunities across the UHCC system. During Imua’s two-year period, 96 scholarships will be awarded to undergraduates enrolled at the coalition’s four campuses. These students will be provided training and hands-on experience in the design, construction and test phases involved in fabricating small payloads. A select number of these students will attend the proposed sub-orbital and orbital flights for their completed payloads. Each year, all students engaged in Project Imua will participate in a training workshop on payload circuit board assembly. Besides offering these advanced

learning opportunities in STEM-based education, Project Imua will developed two new curricular initiatives a course on Launch and Range Safety Protocol and an aerospace science certificate at one of its member campuses. During the first year, the Imua coalition will fabricate a space-based scintillator for the detection of high energy neutrons. Upon successful static and flight testing to be conducted at a local military airfield, this payload will first be launched into sub-orbital flight at Spaceport America in conjunction with New Mexico State University. As a contingency to our application for payload space through the NASA Sub-orbital Flight Opportunities Program, Project Imua would rely upon a half-canister sub-orbital launch via RockSat-X. Upon its successful sub-orbital flight, this payload will be re-fitted by HSFL for orbital launch from the Pacific Missile Range Facility on Kauai in early 2016. One of our coalition members will operate its satellite tracking ground station for this orbital mission. A second payload will undergo a similar fabrication and testing process during the second year. Consisting of a UV spectrometer, this payload would be launched into sub-orbital flight by the RockSat-X system. Upon completion of this two-year project, the lessons learned and partnerships established will provide the UHCC campuses a proven platform for moving forward (imua) in playing a major role in the design, fabrication, launch and support of Hawaii CubeSat missions. All documentation for this enterprise will be posted on the Project Imua website and made available as a model for other organizations to emulate.



Georgia Space Grant Consortium– Proposal #29

Dr. Stephen Ruffin

## **Pathways to STEM Careers in Georgia: NASA Inspiration in 2-Year Degree Programs**

Objectives of this proposal are to create and develop collaborative, well designed, and sustainable activities using multiple pathways. This innovative program will: 1) Develop a seamless pipeline for technical and community college students to transfer to a 4 year college or university; 2) Design a competition that will foster camaraderie and collaboration among institutions, provide hands on experience; and encourage innovation and meet the needs of the State; Inform and encourage faculty to get exposed to NASA research and opportunities and translate NASA related to content into their courses; Offer a scholarship program for students who will pursue 4 year degrees; 5) Provide Internship opportunities for students to conduct research at NASA facilities and in aerospace industry.

Methods and Techniques: West Georgia Technical University, Central Georgia Technical College; and Atlanta Metropolitan College will form teams to participate in an annual unmanned Aerial vehicle competition. The UAV competition is to demonstrate how technology can make farmers and forestry workers more cost effective and also monitor crop disease, drought and mineral deficiencies. The students on the teams will be expected to apply their academic skills in this hands on project. Students from the aforementioned schools will team with mentors (who are Space Grant Fellows) from GSGC 4 year colleges and universities. Transfer articulation agreements will be extended with the 4 year institutions in the consortium. Five GSGC affiliate members have existing articulation agreements for transferring with WGTC, CGTC, and AMC in non-STEM fields so there is an existing framework and the work in this proposal will build upon any other current initiatives that can also be replicated and sustained. Internships and enrollment Incentives, via scholarships, will be given to students who pursue 4 year degrees. Internships, in particular, have long been noted as a primary factor in promoting student interest in and continuation in STEM fields of study.

Significance of the Proposed Work: In 1979, NASA and the Department of Agriculture teamed to use Landsat systems for agricultural purposes. Twenty

years later in 1999, the Alabama and the Georgia Space Grant consortium funded research to use remote sensing for agriculture. Since that time, the technology at NASA has improved significantly with the growth of unmanned aerial vehicles. The resulting spinoff applications for a state like Georgia where agriculture is the number one industry are important economically, environmentally, and educationally. Further, the engagement of community and technical colleges in activities that are more commonplace in 4 year colleges and universities will help with increase the number of students who will continue their education. The student competition, mentoring, articulation agreements, infusion of NASA content into existing courses, scholarships, and internships are all part of the programs proposed by the GSGC that will ultimately lead to a successful pipeline resulting in the production of more 4 year STEM degrees.



Illinois Space Grant Consortium– Proposal #30

Prof. Philippe Geubelle

### **Engaging community college students in STEM through high altitude ballooning: A partnership between the Illinois Space Grant Consortium and the City Colleges of Chicago**

The two-year project described in this proposal aims at establishing an active collaboration between the Illinois Space Grant Consortium (ISGC) and the City Colleges of Chicago (CCC) in hands-on projects, STEM course development and outreach activities in the area of high altitude ballooning. A key component of the project is to engage students from the CCC, both STEM non-majors and majors, in authentic scientific research involving high-altitude ballooning, including research, instrumentation, flight operations, data analysis and presentation of results. This effort involves the development of research modules for the classroom aimed at engaging general education non-STEM majors in high altitude ballooning (HAB) and the authentic practice of science. A group of CCC students will also work with CCC faculty during the summer to develop research projects and gather data in areas of research that lend themselves to high altitude ballooning: biology, chemistry, engineering, environmental science, mathematics, physics and remote sensing. Students and faculty involved in these projects will also take part in outreach activities, building on the successful Saturday Academy headquartered at one of the CCC (Malcolm X College).

It is expected that a total of 42 STEM Scholars, 1150 non-STEM majors and more than 3000 students will be impacted by the research projects and course modules supported by the grant. Dissemination of best practices to community colleges in the Chicago area and downstate Illinois, and professional development of educators will be achieved through the organization of four two-day community college HAB workshops, two in Chicago and two in Champaign.

The proposed project contributes to multiple objectives of NASA Education, including (i) providing groups of post-secondary students to engage in authentic NASA-related mission-based research and development activities; (ii) developing NASA-related course resources for integration into STEM disciplines; (iii) providing short duration professional development and training opportunities to educators,

equipping them with the skills and knowledge to attract and retain students in STEM disciplines; (iv) providing long-duration and/or sustained professional development training opportunities to educators in STEM disciplines; and (v) providing K-12 students with authentic first-hand opportunities to participate in NASA mission activities.



Idaho Space Grant Consortium– Proposal #31

Dr. Joseph Law

**Opportunities to Recruit, Boost, Invest, and Transfer into Science, Technology, Engineering, and Mathematics (ORBIT STEM) - Proposal in response to National Space Grant College and Fellowship Program Cooperative Agreement Notice: Competitive Opportunities**

Description of Key, Central Objectives: NASA Idaho Space Grant Consortium (ISGC) proposes the Opportunities to Recruit, Boost, Invest, and Transfer into Science, Technology, Engineering, and Mathematics (ORBIT into STEM) project will provide direct support to community college students and faculty to increase recruitment, retention, and completion of degrees (including transfer to 4-year institutions) in STEM fields. The ISGC will partner with the College of Southern Idaho (CSI). CSI will manage many of the activities of the grant, however, the scholarships and other special project opportunities will be available to all community college students and faculty in Idaho. The five guiding goals for this project are: Goal 1: Increase the number of students pursuing and completing STEM degrees and transferring/transitioning to careers in STEM disciplines. Goal 2: Focus project services on Idaho students underrepresented in STEM disciplines. Goal 3: Award success-structured scholarships that incentivize success, retention, and completion. Goal 4: Strengthen collaboration between Idaho’s community colleges, universities, and industry to facilitate transitions into four-year institutions and careers. Goal 5: Provide NASA/STEM content-focused professional development opportunities for STEM educators at Idaho’s community colleges. Methods to Accomplish Goals:

The activities under Goal 1 focus on recruitment through two main activities: 1) The development of a near-peer mentor program aimed at recruiting underrepresented minorities in to college and STEM areas of study, and 2) Outreach to local schools through school science fairs and other STEM activities at schools and in the community. The activities under Goal 2 focus on engaging underrepresented populations in STEM fields. Sample activities include "Girls’ Science Night" lab workshops and the creation of a dual-enrollment robotics class and competition team will focus on engaging first generation, low-income, and Latino students, in STEM activities. Goal 3 focuses on providing significant support to community college students through competitively awarded success-structured scholarships

that incentivize success, retention, and completion. Over the 2-year duration of this project, over \$200,000 in significant financial support (\$5000 per scholarship) will be available to community college and technical school students throughout Idaho. The activities under Goal 4 will facilitate transitions into four-year institutions and careers. One major activity under this goal will be an alternate spring break trip where community college students will tour colleges and explore transfer options. Goal 5 activities provide STEM -focused professional development opportunities for educators at Idaho's community colleges. Six awards of \$3,000 will be available to STEM educators at community colleges and technical schools throughout Idaho to allow them to develop new curricula or participate in professional development activities to increase the effectiveness of STEM teaching in the classroom. Perceived Significance: Recognizing the need to increase Idaho college graduation rates to reflect the demands of today's workforce requirements, Idaho's State Board of Education set an ambitious goal: 60 percent of young Idahoans, age 25-34, will have a postsecondary degree or certificate of value by 2020. With this goal in mind, Idaho crafted the Complete College Idaho plan that focuses on five goals that work together to achieve the 60 percent goal by 2020: 1) Strengthen the pipeline; 2) Transform remediation; 3) Demystify college; 4) Structure for success; 5) Reward progress and completion. Idaho's focus on the Complete College plan aligns with the goals of the NASA Space Grant Community College and Technical School Cooperative Agreement Notice and the activities proposed are designed to meet the needs of both Idaho and NASA.



Oregon Space Grant Consortium– Proposal #32

Dr. Jack Higginbotham

### **Oregon Space Grant Consortium Community College Partnership**

Oregon Space Grant Consortium, OSGC, proposes to develop the first two-years of a curriculum leading to an Associate Degree of Science that would serve as pathway to a new Bachelor of Science Degree in Space Studies. Of the fifteen OSGC academic affiliates, none has the financial or faculty resources to develop such programs individually. However, with the advent of mature distance education programs at each of these institutions and the strength of the OSGC network, the collective state university resources can be connected to deliver these STEM degrees. Student interest is high for such a STEM pathway - either as a major or a minor coupled with a traditional engineering or science degree and because of dual enrollment agreements, students enrolled at any of the community colleges will be able to complete the classes at any of the other colleges. From the community college perspective, each college will offer a subset of the Space Studies classes but in totality the entire curriculum will be taught each year, thus maximizing faculty and facility resources across the state.

It is proposed that in the next two years, the OSGC community colleges, Portland Community College, Lane Community College and Linn Benton Community College, develop the first two years of the Space Studies curriculum, modify existing courses for distance or hybrid delivery, develop new sophomore level courses in the field of Space Studies and focus the use NASA STEM content into those courses to better prepare students for future internship and educational opportunities. Finally, the OSGC Director and the Chair of the OSGC Curriculum Council (Community College Affiliate Representative) will develop articulation agreements between community colleges and four-year universities to allow community college students with an Associate Degree that includes these Space Studies courses will receive a block transfer of credit to the 4 year institution.

This opportunity gives Community College faculty a reason to revisit their course syllabi with eye of including NASA content, develop a collaborative relationship between faculty of different institutions to share best practices in the class room and with recruiting of students to a Space Studies track. OSGC longitudinal

tracking results of the past decade show over 90% of significantly supported students stay in the STEM field. Expanding those practices to more community college students and faculty will have a profound impact on retention, graduation and recruitment rates; given the average transfer rate for these colleges is 18%. The bottom line objective is to triple (increase to 54%) the STEM graduation and transfer rates of significantly supported students from OSGC community colleges to four year institutions and for the students to represent the demographics of Oregon's student population and the goals of NASA 14% underserved and 40% female.



Wisconsin Space Grant Consortium– Proposal #33

Kevin Crosby

## **STEM Persistence through Early Engagement with Balloon-Platform Research**

The Wisconsin Space Grant Consortium (WSGC) seeks to engage first- and second-year students in highly challenging, NASA-inspired engineering and science educational activities. This project will focus efforts on retaining first- and second-year students with an interest in majoring in science disciplines, especially those at Wisconsin tribal colleges and 2-year institutions. We propose to utilize WSGC and partner experience and resources to train students and faculty at partner schools to design, build, fly and analyze data from science payloads launched on tethered balloons. The program is designed to be both mentor- and student-driven and ultimately self-sustaining.

The specific strategies associated with the recruitment and retention goals of the proposed program are to (1) provide participating students an experience in authentic, robust, discovery-based science research in a nurturing and supportive environment, that fuels their enthusiasm for, and their confidence in attaining, a STEM major; (2) create a program that will, with minimal follow-up funding from the WSGC, be sustainable at 3 partner schools; and (3) support a diverse STEM workforce in the state.

The proposed program is targeted directly at STEM recruitment and retention in Affiliate institutions with a high percentage of historically underrepresented communities. The College of Menominee Nation will be the institutional home for the training workshops and student/faculty development efforts associated with the grant activities. The impact on STEM retention of hands-on research opportunities in a supportive and nurturing environment of faculty and peer support is well documented.

The proposed program activities are designed to minimize the primary obstacles to initial engagement with STEM research for students with no prior exposure to the culture and practice of science. These obstacles include assumptions about technical language facility, lack of exposure to structured, algorithmic thinking, a competitive culture of individual achievement rather than a supportive culture of

shared achievement, and minimal prior exposure to mathematics. By eliminating or minimizing these barriers to success and providing a structured experience with science outcomes that are relevant to the home communities of our participating students, the program activities will incentivize students to continue their coursework in science and engineering.



Indiana Space Grant Consortium– Proposal #34

Prof. Barrett Caldwell

### **Indiana Space Grant Consortium Competitive Opportunity for Partnerships with Community Colleges and Technical Schools 2014-2016: Indiana Community College Partnership (INCCP)**

The INSGC Community College Partnership (INCCP) program represents an unprecedented partnership between the Indiana Space Grant Consortium, Ivy Tech Community College, and Vincennes University. Both Ivy Tech Community College and Vincennes University operate multiple Indiana campuses with unique strengths tied to local communities and industries. Ivy Tech was founded in 1963, and serves as Indiana’s largest public higher education institution (and the largest single-accredited community college system in the US) with over 200,000 students served annually. Vincennes University (VinU) was founded in 1801, and is one of the oldest two-year degree serving institutions in the US. VinU, as the state’s only residential 2-year transfer institution, is equipped to foster student success in a much less intimidating environment than a typical large state institution.

Both Vincennes and Ivy Tech have recently undergone substantial organizational changes, making this style of partnership feasible for the first time in INSGC history. Previously, neither Ivy Tech nor Vincennes operated with consistent articulation agreements with the four-year higher education institutions in the State of Indiana. Vincennes has recently expanded its aviation technology and other STEM education offerings as part of a major statewide capital projects emphasis. Prior to 2014, a coordinated collaboration with Ivy Tech had been attempted and considered unworkable. In January, 2014, Ivy Tech announced its most significant major restructuring and reorganization in its 50-year history. The new organizational structure permits, for the first time, INSGC collaboration with a coordinated statewide community college system. As a result of the Ivy Tech reorganization and Vincennes expansions, INSGC can effectively coordinate the distribution of funds to community college students, and significantly improve the integration of 2-year and 4-year institutions with the regional advanced manufacturing, advanced materials, aerospace, and robotics employment skills needs of Indiana industry.

A total of six community college campus sites (four Ivy Tech and two Vincennes) will participate in this partnership, representing a variety of STEM Domain Areas suited to the local Economic and Workforce Emphases of major industry needs of those regions. Our focus is on a broad conceptualization of student success, including effective recruitment, retention, mentoring, and completion of Associate's Degrees in STEM fields, while enabling students to make suitable choices between STEM workforce employment and low-risk transfer to four-year STEM university programs. INCCP will target 10 students per region per year, resulting in at least 60 community college students per year obtaining significant STEM scholarship and workforce development experiences. Although students will be eligible to participate in a second year of activity, it is expected that at least 15 Year 1 participants will transition to a STEM workforce position or transfer to a four-year institution. Those completed students will be replenished with 15 more students recruited during Year 1 for Year 2 activity. Thus, we anticipate that at least 75 Indiana community college students will receive significant experiences and STEM-related workforce development opportunities as a result of this program. These students will be supported and encouraged by up to two success coordinators (community college faculty or staff directly tasked to assist students in career mapping, STEM workforce preparation, and supporting connections to industry internships) at each of the six regions. Success coordinators at each region will obtain locally-relevant professional development training (including NASA STEM education curriculum materials) by WisdomTools, a NASA Summer of Innovation provider who will apply their successful professional development activities currently underway for K-12 teachers at-risk Indiana schools.



California Space Grant Consortium– Proposal #35

Prof. John Kosmatka

### **Promoting STEM Preparation at California Community Colleges Using Low-Cost Programmable Micro-Computers**

Many of California's best and brightest high school graduates cannot afford or are not prepared to enter either the University of California or the California State University System. Instead they begin their post-secondary school education in the California Community College System, which includes 112 community colleges and over 2.1 million enrolled students. This two-year college system provides workforce training, certificate and degree programs, and critical preparation to four-year universities. Many of these community colleges strive to develop better bridge programs for their students interested in pursuing a STEM (Science, Technology, Engineering, and Math) degree program at a four-year university. The current proposal to NASA is a two year pilot program that is designed to enhance the STEM preparation at 12 California Community Colleges and improve a bridge opportunity for 300 students to either the University of California or the California State University system. The proposal is in direct alignment with the Co-STEM Priority Areas 3 and 4: Enhance the STEM Experience of Undergraduate Students and Better Serve Groups Historically Underrepresented in STEM and is also in direct alignment with NASA Education Lines of Business: STEM Engagement and Educator Professional Development. This multi-faceted program includes (1) the development of a new UC-approved distance learning STEM course for community college faculty and students that includes education and training in programmable microcomputers and current NASA research activities, (2) the development of exciting student team STEM based projects, taught at each of the community colleges, using low-cost programmable microcomputers to enhance the students' STEM preparation leading to increased STEM retention and an improved bridge to four-year universities, (3) direct involvement of the community college faculty with one of three California NASA Centers through an annual one-day facility visit that includes tours and meetings with researchers and the Office of Education for the purpose of adding NASA content to existing campus programs and student projects, and (4) direct involvement of the community college students with one of three California NASA Centers through an annual one-day facility visit that includes tours, seminars and career counseling with researchers. Each community college is free

to select their own team project that involves the use of programmable microcomputers to collect, store, and transmit in-field sensor and GPS locator data, as well as drive a controller. Proposed example projects, include near-space ballooning, small satellites, UAV auto-pilots, autonomous ground robots, and wearable sensor vests for sports and health monitoring. Fellowships and awards will be focused towards historically underrepresented groups, active military and veterans, and students with physical and learning disabilities. Both students and faculty will have significant investments (over 160 hours of involvement) in this project through the training, hands-on team projects, and visits to the NASA Centers. This proposed program is designed to be easily sustainable, as well as expandable to additional community colleges, where continuation costs are minimal: (1) training for community college faculty using the distance learning course that will have already been developed, (2) student-led projects for improved STEM preparation, and (3) NASA-led interactions with the faculty and students.