

West Virginia Space Grant Consortium
West Virginia University
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Grant Number: NNX10AK62H

PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The West Virginia Space Grant Consortium is a Designated Consortium funded at a level of \$845,000 for fiscal year 2010.

PROGRAM GOALS

Our overarching goal is to extend the benefits of NASA's research and education to all citizens of West Virginia and to promote and support STEM education in the state. Specifically, the goals that were outlined in our five-year plan are:

- (1) To contribute to, and advance NASA's vision and strategies as outlined in various NASA documents (such as the Strategy for American Innovation), specifically in terms of workforce development
- (2) To contribute to the state of West Virginia's efforts in research infrastructure development, particularly in the high-technology sector, and improving levels level of science and math in K-12 education
- (3) To increase the participation of under-represented groups in our programs for students and faculty.

Diversity Goals

As reported by the National Center for Education Statistics Digest, the minority enrollment in degree-granting institutions, by race/ethnicity in West Virginia (excluding the Asian/Pacific Islander category) is 9.5%, one of the lowest in the nation. Recognizing the need to include this population in all aspects of Consortium activities, WVSGC has set a diversity goal of 10%, across its programs.

Our target for participation of women is at least 30% in all our programs. This target may be very ambitious in our research programs due to the fact that the number of female faculty and researchers in STEM fields is much smaller than the number of men in these fields. Out of 111 fellowship/scholarship awards at the affiliate level, 46 (41%) went to female students and 11 (10%) went to students from underrepresented groups.

Both of the two HBCUs in our state are members of the WVSGC. These two institutions, Bluefield State College and West Virginia State University, are treated similar to all other academic affiliates in terms of having access to our regular internships (\$11,000 per year, 1:1 cost share), research (\$6,000 per year, 1:1 cost share) and various outreach opportunities.

SMART Objectives for Higher Education Programs

Subsequent to the reviews of our 20th year evaluation, the following SMART objectives were specifically developed for our Higher Education Programs and approved by the Board of Directors of WVSGC.

“The objective of WVSGC’s Higher Education Program is to enhance higher education capabilities in STEM in West Virginia. WVSGC is in a unique position to initiate and support innovative programs that enable WV students to engage in hands-on experiences that will better prepare them for careers at NASA, its contractors, and other high-technology companies in the US. Our SMART objectives are:

- To support at least two new STEM courses per year at undergraduate and graduate levels at WVSGC academic affiliates;
- To initiate and support programs such as the Balloon Satellite Project, Microgravity Research Program, and High Altitude Student Platform (HASP); and to participate in programs such as RockOn that have been made available through other Consortia;
- To insure sustainability by securing at least 1:1 cost share from participating affiliates for the above higher education programs; and
- To provide partial support to special projects of student organizations such as AIAA, SWE, NSBE, Astronomy Club, and Student Partnership for the Advancement of Cosmic Exploration (S.P.A.C.E.)”

Goals and SMART Objectives for Fellowship/Scholarship Programs

Goal: To contribute to, and advance NASA’s vision and strategies as outlined in various NASA documents, specifically in terms of workforce development. Our SMART objectives are:

- To maintain the minimum number of Space Grant fellowships/scholarships at 120 per year.

- To place at least ten summer interns at NASA field centers (including the Academies) and high tech companies in West Virginia; and
- To increase the number of students who benefit from our Fellowship/Scholarship and summer internship programs by 5% per year in the next five years (assuming the availability of at least the same level of funding).

Goals and SMART Objectives for Research Infrastructure Programs

Goal: To contribute to NASA's and the state of West Virginia's efforts at research infrastructure development (particularly in the high-technology sector). Our SMART objectives are:

- To support new faculty members at our academic affiliates through seed grants and assistance in building collaborative efforts with a NASA scientist. We will make at least 20 seed grant awards per year.
- To support at least two new STEM courses per year at undergraduate and graduate levels at WVSGC academic affiliates; and
- To help and support all faculty members at our academic affiliates to initiate collaborative research with the high tech sector in West Virginia. We will support at least two such projects per year.

Goals and SMART Objectives for NASA Education Outcome 2

Goal: The goal of WVSGC is to support the development of innovative STEM related courses/activities and participation in professional development opportunities at the pre-college level. Our SMART objectives are:

- To support programs that enhance the use of NASA-developed training programs at the secondary education level for teachers in WV. We will fund at least two such projects that would support STEM teachers to attend professional development opportunities (at least 10 teachers per year); and
- To support in-service and pre-service teachers to implement programs that would stimulate the interest of pre-college students in STEM areas. We would like to support at least two teachers (or teams of teachers) to implement such programs to cover a minimum of 50 students per year.

Goals and SMART Objectives for NASA Education Outcome 3

Goal: The goal of WVSGC is to support the development of new and innovative extension and outreach programs such as conferences that promote the understanding, education, development, and utilization of space; seminars that encourage interdisciplinary training and informal education activities for the general public in West Virginia. Our SMART objectives are:

- To support and fund at least two projects in public extension and outreach per year;
- To be proactive in conducting collaborative public extension programs with our partners and various entities in the state; and
- To reach as many members of the public in West Virginia as possible and enhance their understanding of the importance of STEM education, as well as the positive role NASA plays in high-tech workforce development. We aim to outreach to at least 1,000 members of the public in West Virginia.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1, 2, OR 3)

Outcome 1: Employ and Educate

In 2010 WVSGC provided numerous opportunities for students at its academic affiliates to participate in summer internships at NASA centers as well as high tech companies in West Virginia. We also sponsored several higher education programs that benefited our STEM students directly and helped them to get them ready for a future in STEM career. Overall, 16 students (4 female, 12 male) interned at a NASA center or a high tech company in the summer of 2010. They represented ten academic departments and three institutions of higher education in West Virginia. Five students were placed at NASA Academies. Our students also participated in internships at MSFC propulsion internship program, LARSS, and the LPSA program at GSFC.

WVSGC has contracted the services of the National Space Grant Foundation (NSGF) to work with WVSGC to implement our student longitudinal tracking system. The following information was compiled from the NSGF Longitudinal Tracking program.

Percentage of students whom have taken their next step and have been successfully tracked though their next step vs. last year of SG support.

- 71% for 2006 (increase from 67% in 2009)
- 100% for 2007 (increase from 96% in 2009)
- 100% for 2008
- 100% for 2009
- N/A for 2010 – all participants are still enrolled

Also, the following information was compiled from the NSGF Longitudinal Tracking program:

- 33 students took next step in FY10 (SG participation supported from FY06-FY10 funds)
 - 13 are pursuing advanced degrees in STEM disciplines
 - 2 accepted STEM positions at NASA contractors

- 6 accepted STEM positions in industry
- 2 accepted STEM positions in K-12 academia
- 2 accepted STEM positions in academia
- 8 went on to positions in non-STEM disciplines

The following comments of note were recently submitted to the NASA WVSGC office as part of its longitudinal tracking program.

Devon Miller had a NASA summer internship at Goddard Space Flight Center. Devon is a fourth-year student in the Department of Physics and Engineering at West Virginia Wesleyan College. Devon wrote:

“I participated in the NASA Lunar and Planetary Science Academy. I worked on a lunar dust mitigation project. To permit astronauts to spend more time in space, lunar dust needs to be better controlled. If too much dust enters the living areas, breathing becomes difficult. Our method of controlling the dust problem uses a low-power electron beam in a vacuum and a small electric field that acts as a dust collector. We took a week-long trip to Racetrack Playa in Death Valley, California, to study the phenomena of the roving rocks. The rocks move around on the almost flat surface of a dried-up lake bed. The rocks leave behind trails that are hundreds of feet long. No one has ever witnessed this happening. We took measurements of the moving rocks to form a hypothesis on the mechanisms required to move rocks. National Geographic magazine wrote an article on this project, which included a photo of me.”

In August 2010, Kerri Beth Phillips, PhD candidate in MAE at WVU attended the NASA Connecticut Space Grant Consortium Helicopter Training Experience in New Britain, Connecticut on the campus of Central Connecticut State University (CCSU). Kerri wrote:

“The training activities for this camp included working with a team to construct a vertical takeoff unmanned aerial vehicle, attending courses focused on the basics of helicopter aerodynamics, conducting wind tunnel tests and analysis of a helicopter model at the University of Hartford, and touring both Sikorsky and Kaman Aerospace. At Kaman, we had the opportunity to watch a K-Max helicopter takeoff and conduct an autonomous flight test. Still, arguably the most exciting event for the students participating in this training was the chance to fly in a Schweizer 300 helicopter. Each student had a chance to fly with a certified instructor in this 2-seater, open-cockpit helicopter.” Kerri added “This experience was truly once in a lifetime. I had amazing time learning about helicopter flight, touring the facilities, and flying a helicopter. I would like to thank the West Virginia Space Grant Consortium for allowing me to participate in this life-changing activity.”

Other comments by some other students that benefitted from our program were:

The scholarship allowed me to pursue my academic interests. The experience of presenting my research contributed to my ability to secure subsequent admission to

graduate school. (Michael Adkins - on 07/30/09, 2005 WVSGC Scholar, Federal Aviation Administration - Secretary)

The Space Grant program highly impacted my life by allowing me to research during the school year. I learned more than a class could ever teach; and found the 'ah ha' moment that exemplifies scientific research. My education was mainly increased by the mass journals read, and the help from fellow researchers. My life was impacted by more time spent learning rather than 'working'; in the sense that my job was learning. Perhaps the greatest impact was meeting many professors in several disciplines to find that science evolves everyone and everything (Brooke Adams, WVSGC Scholar).

The research that i was able to conduct due to the space grant allowed me to gain valuable research experience that helped me in my summer job as an industrial intern. (Rory Beck - WVSGC Scholar, Cytec Industries - Lab Intern)

This Space Grant program provided me with much needed financial assistance as I endeavored to make progress on my undergraduate research project. The opportunity to do this research was made possible by this program, and the experience I gained while doing research has proved invaluable to me. I am now in my senior year of my undergraduate program at Wheeling Jesuit University and am looking forward to continuing the research I began last year thanks to this Space Grant program. (Talia Blankenship - on 09/07/10, 2009 WVSGC Scholar)

Outcome 2: Educate and Engage

WVSGC continued its support of the Micro-Gravity Research Program and the RockSat Programs at West Virginia University. Two new programs were also sponsored by WVSGC: the WV Aerospace and Engineering Scholars Experience (WVAES) and the WV Lunabotics Mining competition. 39 students and 10 members of the faculty participated in these four programs (45 male, 4 female, 46 Caucasian, 2 African American and 1 Hispanic).

Brief description and highlights from these programs are included in the following:

- On November 3, 2010, WVU Microgravity Research Team presented to incoming freshman during WVU's annual "Fall Freshman Departmental Tours." The team introduced the group to the Reduced Gravity Student Flight Opportunities Program, shared a video of last year's team, and talked about this year's project. On November 6, 2010, other members of the team introduced high school students to microgravity during WVU's "High School Visitation Days." The team discussed the concept of the RGSFOP, showed the students around the lab, and presented on previous experiments that WVU has flown.
- The WV Aerospace and Engineering Scholars Experience (WVAES). West Virginia Space Grant Consortium, Fairmont State University, and the Mid-

Atlantic Aerospace Complex have partnered with NASA Johnson Space Center to provide the exciting opportunity of a NASA-based science, technology, engineering, and mathematics (STEM) educational program for high school juniors in West Virginia. The WVAES is a competitive program that allows high school juniors to apply to take an engaging online NASA-developed course using a Space Exploration theme to teach a broad range of science, technology, engineering, and mathematics skills aligned with West Virginia's Content Standards and Objectives. Based on their course performance, scholars were selected to participate in an all expense paid, three-day residential academy at Fairmont State University during the first week of August, 2010.

- WVSGC, in collaboration with the College of Engineering and Mineral Resources at WVU, is fielding a 15-member team to compete in the second annual Lunabotics Mining Competition, sponsored by NASA ESMD. The team, which is composed of six graduate students and nine undergraduates in computer and electrical engineering, as well as mechanical and aerospace engineering, will compete against other university-level teams at the Kennedy Space Center in May 2011. The objective is to construct a remote control excavation robot capable of moving at least 10 kilograms of simulated lunar material within 15 minutes.
- RockSat Program is a collaboration between the Physics department and Mechanical and Aerospace Engineering department at West Virginia University. Six students participated in this program and they are building their payload to be flown in the summer of 2011 at Wallops Island. This program has enjoyed the support of industry. ATK/WV will provide independent testing of the payload in April 2011; Analog Devices/Massachusetts has donated payload components in excess \$1,100 in retail value; Images SI, New York has donated Geiger counter testing components of \$75 in retail value.

The following comments were recently submitted to the National Space Grant Foundation as part of our longitudinal tracking program.

Question: How did participation in these programs impact your education and life?

It helped me gain a further understanding of research and helped me cement my career goals. I am now in a PhD program and am eagerly waiting to start my graduate level research. (Mike Booth - on 09/07/10, 2009 West Virginia Space Grant Scholar, VA Tech - Teaching Assistant)

It has helped me to learn better time management skills and gain more from my college experience. It forced me learn about new technologies and strive to be the best i can. (Matthew Boots - on 11/04/10, 2009 West Virginia Space Grant Scholar, 2010)

NASA/WVSG Undergraduate Research Fellowship Program, WVU - Research Assistant)

Participation in Space Grant funded activities kept me interested in engineering throughout my college experience. I have remained active as a volunteer for the Space Grant funded Balloon Satellite course since graduation, and intend to do so into the future. (John Brewer - on 08/18/10, 2007 High Altitude Student Payload Project, Booz Allen Hamilton - Consultant)

The program helped me pursue my own research area of interest and answered several important questions involved with wing circulation control and lift theory. (Patrick Browning - on 04/07/10, 2006 West Virginia Space Grant Graduate Fellow, West Virginia University - Post Doctoral Fellow)

It gave me opportunities to explore and become educated in chemistry through instrumentation (Lee Cameron - on 04/08/10, 2007 West Virginia Space Grant Internship, Alliant Techsystems - Intern)

It allowed me to focus on research and not on financial burdens. They've also did a wonderful job of promoting my work. (Jerry Carr - on 08/04/10, 2008 West Virginia Space Grant Graduate Fellow, 2009 West Virginia Space Grant Graduate Fellow, 2010 NASA/WVSG Graduate Research Fellowship Program, Spallation Neutron Source - Cooperative Student/Researcher)

Outcome 3: Engage and Inspire

WVSGC and the Mid-Atlantic Aerospace Complex (MAAC) hosted their second annual Aviation Summer Camp. The experience was made possible through a NASA educational grant to MAAC. Space Grant assisted with the logistics and coordination of this event and members of West Virginia University's Student Participation for Advancement of Cosmic Exploration (SPACE) assisted in planning and served as mentors for the campers. This summer camp provided an opportunity for 50 middle school students selected from a 20 county region in West Virginia to have an all expense paid, engaging and aviation focused experience at WVU's College of Engineering and Mineral Resources, June 10-12, 2010. Kick off for the camp was a presentation by former astronaut Jon McBride. Other events of the first day included team building activities, engineering design challenges, tours of WVU labs, and presentations by Spinning Bees. On the second day, the camp traveled to Wheeling, WV to participate in an onsite mission at the Challenger Learning Center. The camp concluded by spending day three at the Bridgeport Airport and taking part in the Aviation Day activities which included hands-on aviation related demonstrations and static displays.

As reported in the Dominion Post Newspaper for the tri-county region, one camper was from Suncrest Middle School soon-to-be eighth-grader Brian Donaldson. He said that he was enjoying the camp. "It's good," Donaldson said. "I liked talking to the astronaut."

PROGRAM ACCOMPLISHMENTS

Outcome 1: Employ and Educate

Fellowships/Scholarships: We made 138 F/S awards including 10 Undergraduate Research Fellowships (up to \$5,000 each) and 17 Graduate Fellowships (\$24,000 each). Ten students were funded as part of research grant awards made to faculty.

Of the 111 fellowship/scholarship awards at the affiliate level, 46 (41%) went to female students and 11 (10%) went to students from underrepresented groups. The latest statistics from the US Department of Education, National Center for Education, for enrollment in degree-granting institutions that the average enrollment by ethnicity in the state of West Virginia for African Americans, Hispanics, and Native Americans is 9.5%. We also awarded three fellowships to students with disabilities.

Undergraduate Research Fellowships (up to \$5,000) are competed for at the Consortium level. Ten (10) such fellowships were awarded last year to students from the following Consortium affiliates:

Marshall University:	4 awards, 3 females, 1 male, 4 Caucasians
West Virginia University:	4 awards, 2 females, 2 male, 4 Caucasians
West Virginia Wesleyan College:	2 awards, 2 males, 1 disabled

Graduate Research Fellowships (up to \$12,000 plus cost share of 1:1) are also competed for at the state-wide level. Seventeen (17) awards were made in 2010 in this category:

Marshall University:	9 awards, 5 males, 4 females, 9 Caucasians
West Virginia University:	7 awards, 4 males, 3 females, 6 Caucasians, 1 African American
West Virginia State University:	1 award, 1 male, 1 African American

Please note that this is the first time in our program that a student from a HBCU competed and was awarded a Graduate Fellowship.

Breakdown of the number of students who have received direct support funding during the FY2010 reporting period by affiliate was as follows:

West Virginia University	44
Bethany College	6
Bluefield State College	8
Fairmont State University	6
Glenville State College	3
Marshall University	33
Shepherd University	17
West Liberty State University	7
Wheeling Jesuit University	14
WV State University	8

WV Wesleyan College	14
WVU Institute of Technology	0
Total	160

The following comments were submitted to the NASA WVSGC office in response to the question: “What role have you played in the aerospace industry since graduation?”

- Since graduation, I have been working as a graduate student at the University of Pittsburgh in applied nanomaterials research. Such research has been focused on carbon nanotubes and analogous materials for materials, medical, and energy development. (Brett Allen - on 06/28/10, 2005 West Virginia Space Grant Scholar, FLIR Systems - Senior Research Scientist)
- I have been working as an aerospace engineer. I have been building and analyzing sounding rocket models and will soon do field work for launches. (Andrew Blazek - on 10/11/10, 2008 Balloon Satellite Project, Kratos - Rocket Support Services - Aerospace Engineer)
- I have worked beside key members of the aerospace industry working to develop long term methods of maintaining engineering records. (John Brewer - on 08/18/10, 2007 High Altitude Student Payload Project, Booz Allen Hamilton - Consultant)
- I have been able to teach fundamental aerospace courses (Introduction to Aerospace Engineering & Flight Vehicle Propulsion) at the college level and am also involved in new areas of US military funded research specializing in aerodynamics design. (Patrick Browning - on 04/07/10, 2006 West Virginia Space Grant Graduate Fellow, West Virginia University - Post Doctoral Fellow)
- Involved in research and industrial production of rocket motors (Lee Cameron - on 04/08/10, 2007 West Virginia Space Grant Internship, Alliant Techsystems - Intern)
- My graduate research can lead to a better understanding of coronal heating and space propulsion. (Jerry Carr - on 08/04/10, 2008 West Virginia Space Grant Graduate Fellow, 2009 West Virginia Space Grant Graduate Fellow, 2010 NASA/WVSG Graduate Research Fellowship Program, Spallation Neutron Source - Cooperative Student/Researcher)
- I am doing basic research in areas that could contribute to technologies used in space travel and exploration, primarily related to materials including photovoltaics. (Mary Underwood - on 08/25/10, 2009 West Virginia Space Grant Scholar, 2010 NASA/Academy, West Virginia University - Graduate Research Assistant)

Other “Higher Education” programs supported by WVSGC include:

Balloon Satellite Course (Spring 2010 semester); Microgravity Program at West Virginia University; Support for AIAA; Sponsorship of the Annual Research Symposium at WV State University (an HBCU); Support for Astronomy Club at WVU; support for Career Fairs (CEMR, NASA LARSS, High Tech Companies & NASA IV&V) which were attended by over 100 employers and over 2,500 students; and support for NASA Scholars to attend conferences to present their research papers.

Research Infrastructure Programs: In addition to the Joint University-Industry Research Opportunity Program, explained later, WVSGC supports two programs in this category:

- Research Initiation Grants are competed for at the Consortium level. These grants are awarded in the amount of (up to) \$20,000 of NASA funds augmented by \$10,000 in cost share. Six such awards were made last year to researchers from three affiliates. In addition to the required collaboration with a NASA scientist, these researchers reported to have collaborated with colleagues from University of Chicago, Harvard University, and the University of Texas. They have also reported the submission of several proposals to funding agencies and publication of their research in peer-reviewed journals.
- Research Enhancement Awards are competed for at the affiliate level. West Virginia University, the lead institution, does not participate in this program. Per an annual subcontract, each affiliate receives \$6,000 in NASA funds (plus 1:1 cost share from the affiliate). Issuing the RFP, deciding on review criteria, and making the award decisions are accomplished by the NASA Committee at each affiliate independently.

The following “Research Initiation Grant” awards were made during the FY2010 reporting period.

Dr. Yu Gu (West Virginia University): OpeRA - Open Research Aircraft. “Due to the flexibility and uniqueness of our flight-testing capability, we anticipate that *OpeRA* would complement NASA’s experimental capabilities in meeting the growing research requirements. Throughout the project, we expect to strengthen our existing links with researchers from NASA Langley and Dryden, establish new connections, and facilitate the development of a long-term research partnership between NASA and WVU.”

Dr. Jeffery Kovatch (Marshall University): Detection of phytoplankton biomass in large rivers with remote sensing. The investigator submitted a proposal to the “DigitalGlobe 8-Band Research Challenge” and was awarded free 8-band imagery. The additional imagery from DigitalGlobe and increased spectral resolution will increase the number of images for analysis and should improve algorithm development. Co-PIs Somerville and Barrios leveraged the funding from this NASA WV RIG to obtain research enhancement support from the Rahall Transportation Institute (RTI), a top National Transportation Center sponsored by United States Department of Transportation. RTI holds a National Maritime Institute and has an interest in remote sensing technologies and their potential uses for transportation systems, including the Ohio River, which is heavily used for commercial navigation. Co-PI Somerville initiated a collaboration with Air Robotics LLC, a startup company in Charleston, WV that builds unmanned airborne vehicle

systems. The investigators are now developing the collaboration to test the low flying airborne vehicles for remote sensing of river systems.

Dr. Bingyun Li (West Virginia University): Advanced Regenerable Solid Sorbents. New collaborations with researchers at the National Energy Technology Laboratory (NETL) were initiated and four concept proposals were submitted to the NETL for consideration.

Dr. Ashish Nimbarte (West Virginia University): Understanding the relationship between ingress, egress and reaching tasks volumes and influence of anthropometric dimensions on motions during such tasks. The proposed research project will be carried out in collaboration with Dr. Rajulu of Anthropometry and Biomechanics Facility at Johnson Space Center, NASA.

Dr. Suzanne Strait (Marshall University): New 3D methods for quantifying tooth wear in primates. Joseph Lavelle, NASA Ames Technical monitor indicated “This research represents an excellent opportunity to demonstrate a unique application for the MILT (Mold Impression Laser Tool), an instrument that was developed at NASA Ames Research Center for use at Kennedy Space Center to measure Shuttle Tile Damage. NASA is presently conducting an intense technology transfer effort for this technology, and to find other applications for its use. Using the MILT on this project (an application in the area of Paleontology, Archaeology, etc) will help provide valuable feedback for its further development and improvement for this technology transfer effort.

Dr. Hongwei Yu (Marshall University): Developing a Genetic System to Evaluate the Radiation Effect on DNA Damage and Repair. He reported: “We feel that we are on the cusp of achieving long term support from funding agencies such as the NIH and NSF.”

Total value of these grants was \$151,920 (\$96,500 NASA, \$55,420 cost share)

Breakdown of the number of Research Enhancement Awards (REA) thus far during the FY2010 reporting period is as follow:

Bethany College:	3 awards (PIs: Drs. John Burns-2 awards; and Dr. Lisa Reilly)
Glenville State College:	4 awards (PIs: Drs Rico Gazal; David O’Dell; Fred Walborn and Larry Baker)
Marshall University:	2 awards (PIs: Drs. Menashi Cohenford; Steen Mewaldt)
Shepherd University:	4 awards (PIs: Drs. A Park; L Park; Groff and Best)
WV State University:	3 awards (PIs: Drs. Fultz; Ruhnke and Schedl)
WV Wesleyan College:	3 awards (PIs: Tracey Delaney, Thomas Brennan and Trevor Stevens)

The total value of these projects was \$121,000 (including 1:1 cost share).

Research Partnerships

In an attempt to foster collaborative research between faculty at Space Grant affiliates and the high tech industry in the state, WVSGC designed and implements the "Joint University-Industry Research Opportunity Program."

Two projects were funded under this program in 2010. The first collaboration took place between Dr. Bert Popson of WV Wesleyan College and Bryce Yeager of Energy Corporation of America for their project entitled "A Study of the Marcellus Shale Formation and its Development potential in WV". The second collaboration was between Dr. James Smith of West Virginia University and Kevin Change of BAE Systems for their project entitled "Driveline Testing Capability Development for Large Wind Turvines and Heavy Duty Hybrid Vehicles."

The total value of these projects was \$80,000 (\$40,000 NASA, \$40,000 cost share).

Outcome 2: Educate and Engage

WVSGC has supported and implemented several programs in direct support of Outcome 2, as follows:

College Course Development

Only the following College Course Development project was funded during the FY2010 reporting period:

Dr. Tracey Delaney, West Virginia Wesleyan College, for his project entitled "Engaging Astronomy Students." Dr. Delaney reported the following:

"As a result of funds from the College Course Development Grant offered through the West Virginia Space Grant Consortium, we have developed an astrophysics course to meet the demand from current students who wish to pursue astronomy as a career. The astrophysics course has been added to the curriculum (Astrophysics - PHYS 388) with the first run set for Fall 2010 without a formal laboratory component. The enrollment for the Fall 2010 semester is currently 9 students (3 female) and it will be held in Christopher Hall room 114. The course will be offered every other year thereafter."

The total value of this award was \$20,000 (\$10,000 NASA, \$10,000 cost share).

K-12 Professional and Curriculum Development Program

Projects supported in this category during the FY2010 reporting period were as follows:

- Ms. Julie Mancini (Principal at Big Elm Elementary School) and Joelle Spagnuolo-Loretta (Senior Systems Engineer with TASC, Inc., supporting the NASA IV&V facility in Fairmont, WV) were the PIs for “Education through Automation” project. The learning activities included in this project were grouped into two disciplines: robotics and simple machines. When asked about the total number of student-based projects supported by this award (long duration, greater than or equal to 2 days in length) Ms. Mancini wrote “This project lasts the entire school year and will continue to be implemented for many years to come. Each student in grades 1-5 are learning from the multiple activities. In the end - thousands of students will have benefited from this project.” When asked if evaluation mechanisms were in place which demonstrates that this student-based project quantitatively contributes to the STEM pipeline, Ms. Spagnuolo-Loretta replied: “Yes - The students have been asked to provide input via questionnaires to quantify the Project’s value and their knowledge increase/interest in STEM.”
- Dr. Earl Scime of West Virginia University: “Mountaineer Area Robotics (MARS).” Dr. Scime wrote: “The MARS program focused on the sustainment and expansion of the FIRST Lego League (FLL) robotics program for middle school youth. The program now includes eleven West Virginia counties (Monongalia, Preston, Marion, Harrison, Upshur, Ohio, Mercer, Brooke, Wood, Mingo, and Cabel). The MARS sponsored and/or mentored FLL teams now include twenty-seven teams in these counties. The fall FLL season began on September 4, 2010. Every other weekend, the MARS program provided direct mentorship to regional teams at a facility provided by the Monongalia County Board of Education. On November 20, 2010, the MARS program hosted a regional practice scrimmage that was attended by over 200 people and included 13 regional teams. Following the scrimmage, the MARS mentored FLL teams attended the WV State FLL Tournament on December 11, 2010. MARS mentored teams placed first and second overall, first in research, first in technical, and first in robot performance. The first place team will represent WV at the 2011 World Championship in May 2011 and the second place team will attend the US/Canadian Open in April 2011. High school student recruiting continued throughout the summer and fall. MARS program high school participants currently include over 40 high school students from Morgantown area. The MARS program participated in a number of events in the fall, including the WVU Homecoming Parade; the Morgantown Christmas Parade; a WV PBS documentary; and a variety of public outreach events.”
- Dr. Elizabeth Strong of West Liberty University was the PI of “Macro to Micro Tools of Science Workshop.” She wrote: “This project included up to 20 teachers of K-6 students from Brooke, Hancock, Marshall, Ohio, and Wetzel counties. These teachers serve an average class size of approximately twenty students

annually. One Day workshop focused on recording data as scientists do and on writing across the curriculum.”

- WV Math Field Day: Math Field Day was developed to interest and inspire students to achieve through competition. This event had over 260 participants

The total value of these projects was \$33,000 (\$18,000 NASA, \$15,000 cost share).

Outcome 3: Engage and Inspire

Formal and Informal Education Programs

NASA WV Space Grant Consortium designed and implemented a competitive program entitled “West Virginia Space Grant Consortium Public Extension and Outreach Grant” Program. A brief description of activities and projects supported in 2010 is provided below.

- STaR (Science, Technology and Research) Symposium at Marshall University. WVSGC co-sponsored this symposium. The theme of the symposium was: *Sustainability: How Science, Technology and Research Can Sustain our Future*. Student researchers and WVSGC Scholars captured first place in both categories of the competition held at the symposium.
- WV State Fair, held August 13-21, 2010, in collaboration with NASA Langley. Over 6,500 people visited our booth. The State Fair of West Virginia has been designated as one of the Top 100 Events in North America for 2011 by American Bus Association, an experienced expert tourism industry selection committee.
- Annual Undergraduate Research Day at the Capitol took place at the Capitol Rotunda, Charleston, WV. Undergraduate Research Day allows students to present their discoveries in poster format and talk to legislators about their findings. The projects are original research and the posters have been designed for a general audience. Keith Garbutt, Dean of WVU’s Honors College, indicated “The students really appreciate the interest shown by members of the state Legislature.” Garbutt said. “Visits with the students have increased each year, we feel this is a clear indication of the interest legislators have in higher education in West Virginia.”
- Eight Grade Career Day at Mylan Park. Over 800 8th grade students from Monongalia County participated in the event.
- The USA Science and Engineering Festival in Washington, DC. The festival was sponsored by Lockheed Martin and was the country's first national science festival. Our AIAA, Microgravity and SPACE students staffed a booth that was directly in front of the National Air and Space Museum on the National Mall.

The following projects were also supported and funded by WVSGC:

1. Dr. James Cercone of WVU Institute of Technology received support for “High Altitude Research Project.” In collaboration with the WVU Department of Mechanical and Aerospace Engineering, a joint launch was conducted at the annual Amateur Radio HamFest. A successful launch reaching an altitude of 110,000 ft was tracked and recovered by the amateur radio community. Dr. Cercone reported the following summary of activities to date:

a). WVU Tech Camp STEM

Category: High School Outreach

Location: WVU Institute of Technology, Montgomery, WV

Personnel: J. Cercone, R. Keller

WVU Tech conducts a one week resident summer camp for students in grades 9-12. One group of six students worked on the balloon project during the course of the week and learned the basics of tracking and launching a balloon. A tethered balloon was used to take aerial video of the WVU Tech Campus.

b). Academic High Altitude Conference

Category: Conference Presentation

Location: WVU Tech, Montgomery

Personnel: J. Cercone, D. Smith

WVU Tech Students: Carl Simpkins, Brad Wolfe

c). Presentations: “Making HARP Mountain Friendly”, Cercone, Smith, Coleman, and Keller. 1st Annual Academic High Altitude Conference, Uppland, IN.

d). Two faculty and two Computer Science Students traveled to Taylor University to attend the 1st Academic High Altitude Conference. Cercone presented a paper entitled “Making HARP Mountain Friendly” and the student provided a “birds of a feather style’ take on their experiences in balloon tracking and recovery.

2. Dr. Sue Ann Heatherly of NRAO: “From Ozma to the Enterprise: SETI in the Next 50 Years” She reported:

“The workshop--From Ozma to the Enterprise, a conversation about the next 50 years of SETI (Ozma50) was a fantastic success according to the 53 participants, and the more than 200 people who viewed the sessions, in real time, online. Invited participants represented three groups:

- Scientists: practitioners of SETI and researchers in scientific fields related to the origin of life(e.g. astrobiologists, astrochemists);
- Scholars: those who study the intersection of SETI and related fields with humanity and society;

- Communicators: Those who communicate science to the public through any medium.

A complete list of conference participants is on file with the NASA WVSGC office and includes several notable figures, in addition to well-known SETI astronomers. Dava Sobel, author of *Longitude and Galileo's Daughter*, Jon Lomberg, artist for the *Cosmos* Television Series with Carl Sagan, Brother Guy Consolmagno, Meteorite Curator for the Vatican illustrate the diverse nature of the workshop participants. For more information visit the website: <http://www.nrao.edu/index.php/learn/gbsc/setimonth>.”

3. Dr. Meri Cummings of Wheeling Jesuit University received support for “WV FIRST LEGO League Robotics Tournament.” She reported:

“This year's tournament was held at Wheeling Jesuit University, the sixth time WJU has hosted the event, which is sponsored by the NASA West Virginia Space Grant Consortium. The theme of this year's competition was Body Forward—Engineering Meets Medicine. The competitors, ages 9-14, programmed their LEGO robots to perform medical repairs, and the students also researched medical concerns in their communities and proposed biomechanical solutions.”

Note worthy comments as reported by participants of the WV FLL Tournament

- “...Just wanted to let you know how AMAZING this tournament was for me and my girls. It was so much fun to be a part of all that energy and excitement. The girls had a great time. I remember at a training you mentioned that there might be tears, who would have thought the one that would be crying at the tournament was going to be me. When the girls were on stage for their missions and their light sensor programs would not work I was the one who was upset for the girls. The tears came when the girls did not let that get them down; they tried different things each time they went up on stage. I starting crying because my girls were amazing and just kept on trying, I am so proud of them. Who would have thought that I was going to learn so much at this tournament? The judges were amazing; I would not want that job for anything. How hard it must be on them to pick award winners from so many awesome kids!!! All the girls can talk about is what they are going to do next year, lol. Sabrina”
- “Thank you for all your hard work and dedication in putting the tournament on. Our team, parents, and supporters all had a blast! We're all now firmly hooked on Lego Robotics and can't wait to start again in the spring. We'll be holding a Robotics afterschool program for the 3rd and 4th graders to learn new programming skills and how to do research. The enthusiasm and encouragement they received from all the judges and tournament support people was wonderful. We can't thank you enough for your support of our effort. Ann Burns, Fairmont.”

4. Nathan Sams of West Virginia Wesleyan College received support for “Summer Gifted Program.” He reported:

“Our 2010 residential program involved thirty-three students participating in classes in mathematics, physics, computer science, creative writing, and social sciences. Through collaboration with the WV Department of Education and Boards of Education in local counties, we were able to identify ten need-based scholarship recipients from West Virginia. Thus, we were able to provide financial aid to 45% of our in-state students. In addition, via communication with gifted educators in neighboring states and the surrounding region, we provided need-based financial aid to two minority students from Virginia, as well as one minority student from Washington, D.C. Besides providing this enriching educational opportunity in STEM fields to economically-challenged and minority students in the region, it is also worth noting that nearly 50% of our participants were female students.”

The total value of these projects was \$90,000 (\$40,000 NASA, \$50,000 cost share).

PROGRAM CONTRIBUTIONS TO PART MEASURES

Longitudinal Tracking

Student Data and Longitudinal Tracking:

Total awards = 56

Fellowship/Scholarship = 27

Higher Education/Research Infrastructure = 29

11 of the total award represent underrepresented minority F/S funding.

During the FY10 program year 13 are pursuing advanced degrees in STEM disciplines, 2 have accepted STEM positions at NASA contractors, 6 accepted STEM positions in industry, 2 accepted STEM positions in K-12, 2 accepted STEM positions in academia, and 8 went on to positions in non-STEM disciplines.

For all students that were significantly supported in the period spanning FY06-FY10, 72 are pursuing advanced degrees in STEM disciplines, 7 accepted STEM positions at NASA contractors, 2 accepted positions at NASA, 41 accepted STEM positions in industry, 3 accepted STEM positions in K-12, 11 accepted STEM positions in academia, and 15 went on to positions in non-STEM disciplines. The remaining students have not yet received the degree that they were pursuing while they received their Space Grant award.

Matching Funds

In 2010, we secured and documented a total of \$626,000 in cost share. Please note that the value of time spent by each of our Board members and NASA Committees at each affiliate has not been included in the cost share figures reported. Also, the fact that F & A (overhead) charges have been waived by the lead institution has enabled us to devote more of our resources to funding various programs.

Minority-Serving Institutions

Both of the only two HBCUs in West Virginia are members of the WVSGC. Bluefield State College is represented by Dr. Felica Wooten Williams and WV State University is represented by Dr. Naveed Zaman. In 2010, both institutions were active in the Consortium and participated in a number of programs sponsored by WVSGC. As indicated before, eight (8) NASA fellowships were awarded at Bluefield State College and eight (8) were awarded at WV State University. WVSGC was a sponsor of the Annual Research Symposium at WV State University.

WVSGC continued its support of the Emerging Leaders Institute (ELI) at Bluefield State College. The goal of this program is to recruit and train minority college students in STEM fields to be mentored by a faculty member. These students visit area high schools and talk to minority students to encourage them to attend college and serve as a role model for them. ELI was established at Bluefield State College several years ago to provide African-American students majoring in STEM fields with opportunities for leadership development through a comprehensive program based in leadership theory and practice. The program stresses civic service and academic productivity, while stressing ethical responsibilities of individuals and organizations. We provided \$15,000 to support this program in FY 2010.

IMPROVEMENTS MADE IN THE PAST YEAR

WVSGC benefits from an engaged and active Board of Directors that examines every aspect of the Consortium's operations critically at every Board meeting. Changes made to WVSGC's operations are mostly evolutionary and represent minor modifications in the course of our operations. However, the following items can be mentioned as more important enhancements to program:

- Addition of a new academic affiliate: The Director and Program Manager of WVSGC met with Dr. Peter Barr, President of Glenville State College, and made him aware of the Consortium's activities and invited Glenville State to join the Space Grant network. President Barr attended the Spring 2010 meeting of the Board of Directors in Charleston, WV and made a formal presentation and request to join WVSGC. This request was unanimously approved by the Board.
- We continued with and refined our on-line submission and review system for all proposals submitted to WVSGC for funding. This system was designed and is supported by the National Space Grant Foundation.
- We hired a new staff member, Ms. Amy Diznoff, to help with our outreach activities, preparing grant proposals, student contact and general office duties.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

The Consortium is governed by a Board of Directors consisting of one member from each affiliate organization and a few representatives from non-profit organizations and state government agencies. In accordance with its Mission Statement and its by-laws, the

Board sets all policies and procedures governing the Consortium operations. Characteristics of our academic and other affiliates of the Consortium are as follow:

- West Virginia University, largest public university in the state, Land Grant, primarily research oriented, represented by Dr. Curt Peterson.
- Marshall University, second largest public university in the state, research oriented, represented by Dr. Charles Somerville.
- Bluefield State College, an HBCU, primarily teaching oriented public university, represented by Dr. Felica Wooten Williams.
- WV State University, an HBCU, Land Grant, primarily teaching oriented public university, represented by Dr. Naveed Zaman.
- Shepherd University, primarily teaching oriented public university, represented by Dr. Reza Mirdamadi.
- WV Wesleyan College, teaching and research oriented private college, represented by Dr. Joseph Wiest.
- Wheeling Jesuit University, teaching and research oriented private university, represented by Ms. Margie Cook.
- Bethany College, teaching and research oriented private college, represented by Dr. Robert Paysen.
- Fairmont State University, teaching and research oriented public university, represented by Dr. Anthony Gilberti.
- West Liberty University, primarily teaching oriented public college, represented by Dr. Robert Kreisberg.
- WVU Institute of Technology, research and teaching oriented public university, represented by Dr. Garth Thomas.
- Glenville State College, teaching and research oriented public college, represented by Dr. John Peek.
- The Clay Center for Arts and Sciences, non-profit organization with the mission to inspire creativity, learning and wonder through experiences in the arts & sciences, represented by Mr. Lewis Ferguson.
- WV High Technology Consortium Foundation, non-profit organization to promote high technology and economic growth in the state, represented by Mr. James Estep.
- Polyhedron Learning Media, Inc., A technology development company specializing in creating educational software, audio/video, and print materials, represented by Dr. Jeanne Finstein.
- NASA IV & Facility, part of an Agency-wide strategy to provide the highest achievable levels of safety and cost-effectiveness for mission critical software for all, represented by Ms. Lisa Montgomery.
- NRAO Green Bank Facility, home to the Robert C. Byrd Green Bank Telescope, the largest fully steerable dish in the world, represented by Dr. Karen O'Neil.
- Dr. Anne Cavalier: Economic and workforce development liaison, US Dept of Commerce, Economic Development Administration

- Mr. Denny Avers, Engineering Consultant, a founding member of the Consortium, then representing IBM.