

West Virginia Space Grant Consortium
West Virginia University
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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 \$730,000 for fiscal year 2008.

PROGRAM GOALS

Goal 1: To contribute to advance NASA's vision and strategies as outlined in various NASA documents, specifically in terms of workforce development. Following are our short term and long term goals in the area of workforce development:

Short Term Goal: to maintain the average number of Space Grant scholarships and fellowships at approximately 200 per year, and to place at least ten summer interns at NASA field centers (including the Academies) and high tech companies in West Virginia.

Long Term Goal: to increase the number of NASA scholars and summer interns by at least 10% each year, depending on the size and availability of additional resources.

Goal 2: To contribute to the state of West Virginia's efforts in research infrastructure development (particularly in the high-technology sector), and to improve the level of science and math skills in pre-college education.

Short Term Goal: To continue with our current level of funding for various research seed programs, and to increase the level of faculty participation at smaller colleges. We also need to make sure that faculty awareness is enhanced by advertising these opportunities more aggressively. For the pre-college and public outreach, we will be more active in finding partners and entities that will add value to our programs.

Long Term Goal: To secure more funding and expand research seed opportunities for faculty and researchers at our member institutions. Expansion of these programs will be made possible by increased NASA funding and finding support from other agencies. We will increase our support for research and pre-college outreach by at least 50% by the end of this 5-year grant cycle.

Goal 3: Increase the participation of females and under-represented groups in our programs.

Short Term Goal: To monitor the percentage of our resources and opportunities awarded to underrepresented groups, including female students and scientists. We will also make sure that we exceed the percentages of under-represented groups in the general population and in the student populations at our member institutions; and meet or exceed the goal for female participation of 40% in all opportunities offered to our constituents.

Long Term Goal: To develop aggressive and effective strategies to recruit under-represented groups to participate in our programs and to take full advantage of the opportunities offered by WVSGC. Another long term goal is to be above the state-wide statistic for under-represented groups by at least 25%; and to meet or exceed the goal for female participation of 40% in all our programs.

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

Outcome 1: Employ and Educate

2008 was a banner year for the success of WV students who received support from WV Space Grant Consortium. For the first time in our history, four (4) of our students were admitted into NASA Academies at Goddard Space Flight Center, Glenn Research Center, and Ames Research Center. These four students were products of the workforce development pipeline that was made available by NASA. They all started with our basic fellowship and then participated in various higher education activities (such as the Student Satellite Program) and built up their experience and qualifications to be admitted to a NASA

Academy. Overall, 16 students (5 female, 11 male) interned at a NASA center in the summer of 2008. They represented seven academic departments and four institutions of higher education in West Virginia.

Outcome 2: Educate and Engage

Curtis Groves, alumni of WVSGC, was featured in an article entitled: "NASA Scholar and Intern Fulfills Childhood Dream, Curtis Groves turns a dream into a reality." Following is an excerpt. Ever since he was a child, NASA Scholar Curtis Groves wanted to work for NASA. That dream began to become a reality after he joined the Microgravity Research Team at WVU where he had the opportunity to design, build, and test microgravity research aircraft. "Getting to work side by side with an advisor on a research project is a valuable experience," said Groves. Groves went on to become an intern at the Kennedy Space Center (KSC). At KSC, he worked in the mechanical division of the space shuttle where he would model the orbiter to the external tank mate simulation. In addition to this experience, Groves was able to watch three space shuttle launches, landings, and a few Expendable Launch Vehicle launches. He also sat at the console during a shuttle launch, an Atlas V launch, and a Delta IV Launch. Groves' experiences as a NASA Scholar lead him to his current job as a civil servant in the Launch Services Program Flight Analysis Division. "I will go through a six month accelerated training program (ATP) where I will work in the aerodynamics discipline. I will be building an aerodynamic model of the Taurus launch vehicle," said Groves. Groves' goals are to have a career with NASA, going back to school for a Master's and Ph.D. degrees, becoming a flight instructor, and working his way up to a Branch or Division Chief. Groves is very grateful for the opportunities WVSGC offered him. "The WV Space Grant office provides many opportunities for students to complete internships and research that would not be attainable without their help and financial support," said Groves.

Outcome 3: Engage and Inspire

WVSGC worked with the current and former NASA Explorer Schools in West Virginia by supporting their rocketry program, the integration of GPS technology into the curriculum, grant writing, etc. The Consortium assisted Piedmont Elementary with the school's successful application to provide a live link-up between Piedmont students and the International Space Station. During that event, students were able to interact with astronaut Clay Anderson, asking him questions about life onboard the ISS. WVSGC also supported the Piedmont faculty by providing NASA shirts and custom-designed business cards. And WVSGC funds assisted the faculty team that experienced a reduced gravity flight at Johnson Space Center.

PROGRAM ACCOMPLISHMENTS

Outcome 1: Employ and Educate

Fellowships/Scholarships: We made 184 F/S awards including 16 summer internships at NASA and high tech companies in West Virginia, 15 Undergraduate Research Fellowships (\$5,000 each) and nine (9) Graduate Fellowships (\$24,000 each). We are proud that four of our students were accepted for internships at NASA Academies at Glenn, Ames, and Goddard. Also, we had 8 WV students participating in the LARSS program. Students who participated in our summer internships came from four affiliates, and seven academic departments.

Out of 168 fellowship awards at the affiliate level, 71 (42.3%) went to female students, and 17 (10.1%) were made to students from underrepresented groups. Statistics from the US Department of Education, National Center for Education, indicate that the average enrollment by ethnicity in the state of West Virginia for African Americans is 6%; and for Hispanic it is 1%. We have exceeded these averages by a considerable amount.

Other "Higher Education" programs supported by WVSGC included:

Balloon Satellite Course (Spring 2008 semester); Microgravity Program at West Virginia University; High Altitude Student Platform (HASP) project; Support for AIAA; Sponsorship of the Fourteenth Annual Research Symposium at WV State University (an HBCU); Support for Astronomy Club at WV; support for Career Fairs (CEMR, NASA LARSS, High Tech Companies & NASA IV&V) which were attended by 150 employees from 21 different states and over 1,500 students; and support for NASA Scholars to attend conferences to present their research papers.

Research Infrastructure Programs: WVSGC supports two programs in this category:

- In 2008, \$110,500 (NASA and cost share funds) was spent on this program. A total of 26 projects were supported at ten affiliates. Eight (8) of these awards were made at the two HBCUs in West Virginia.
- 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. Five such awards were made last year to researchers from three affiliates.

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." Projects that were funded under this program in 2008 are as follows:

- Flight and Space Applications: G. Albert Popson, West Virginia Wesleyan College and Mike Masterman, Extreme Endeavors.
- Developing a novel biopolymer for space exploration: Hongwei Yu, Marshall University and Richard M. Niles, Progenesis Technologies, LLC.

Outcome 2: Educate and Engage

In the "*Higher Education*" category, WVSGC has implemented several programs, as follows:

Balloon Satellite Program: (17 students, 3 F, 14 M, 1 Minority) Over the past six years a "hands-on" aerospace engineering project course has been developed and offered at West Virginia University (WVU), where student teams conceive, propose, design, build, fly, track, and recover small electronic experiment payloads, using helium-filled latex weather balloons to send their payloads well into the stratosphere.

Microgravity Research Program: (8 students, 3 F, 5M, all Caucasian) Senior Aerospace Engineering students design an experiment to be conducted in a reduced gravity environment. The team competes with other college teams across the USA for time on NASA's microgravity platform.

High Altitude Student Platform (HASP): (3 students, 3 M, all Caucasian) Students at West Virginia University developed a proposal for participation in the HASP flight opportunity. The proposed experiment entitled "Distant Aerial Cosmic Radiation Acquisition Package" will measure the intensity of cosmic radiation with respect to altitude and time, and classify different types of radiation according to their energies.

Student Partnership for the Advancement of Cosmic Exploration (SPACE) is a WVU student organization with the vision of "*Creating the Launch Pad for the Future Leaders of Space Exploration*". The newly formed student support group is committed to providing students interested in space exploration with the necessary resources to easily find, apply for, and gain internships and co-ops to supplement their educational experiences. Some of their other goals include: 1) increasing the number of regularly-taught classes at WVU that are directly related to the study of space and contribute toward space exploration; 2) increasing the number of research opportunities available to WVU students; and 3) increasing awareness of space exploration among the general public and the student population.

In the "*Precollege*" category, WVSGC has implemented several programs, as follows:

Mountaineer Area Robotics (MARS): Dr. Earl Scime, Chairman of the Physics Department at West Virginia University, served as the coach for this team. From August 2008 through January 2009, the MARS program accomplished a number of key milestones: a central practice facility for the county-wide FIRST Lego League (FLL) program was obtained from the Monongalia County Board of Education (in Westover, WV); ten local FLL teams were mentored by the MARS program; all ten FLL teams participated in the WV State FLL tournament on December 13, 2008 (MARS sponsorship cost \$450); the MARS program hosted a "pre-championship" scrimmage in Morgantown on December 6, 2008 (and as a result the MARS mentored FLL teams received 8 of the possible 11 awards at the WV State Tournament). MARS program participants currently include 6 female and 13 male high school students. Of the high school students, 6 come from historically underrepresented groups in the STEM disciplines.

Robotics Enabling Active Learning: Dr. Deb Hemler from Fairmont State University and Marcie Raol from the NASA IV&V Facility ERC provided professional development workshops and training. The program has trained 47 educators with a student participation of 161 Elementary, Middle and High School students. Total hours resulted from this project was 883 hours of student use.

Technology Integration in Earth and Space Science: Dr. Elizabeth Strong of West Liberty State College was the leader for this project. 21 educators and 344 students (66 underrepresented) participated in a three-day summer institute with two evenings of "Star Watching" activities. Daytime activities were focused on strengthening teacher and student participants' content knowledge in the areas of earth and space science.

One Year of Space and Sky: Dr. Robert Strong of West Liberty State College was the leader for this project. To fulfill the missions of six local formal science, informal science, and community based entities, a six member consortium for delivering an intensive and upgraded version of previous existing efforts was created. The end result is the concept of bringing "One Year of Space & Sky" events to the public.

Gaining Engineering Experiences through RoboticS (GEERS): Mr. Justin Morris of the NASA IV & V Facility was the leader for this project. A robotics program for children ages 9-18 in Marion County, WV, with the intentions to encourage and motivate students to pursue higher education in science, technology, engineering, and mathematics (STEM). The Mannington 4-H Club served as the pilot group to lay the foundation for a program that will seek to make STEM enrichment activities available to a population that generally has access to few extracurricular activities of this nature.

Reality Based Educational Experiences for Future Engineering Students: Dr. Jack Byrd of the College of Engineering at West Virginia University was the principal investigator on this project. This project addressed the following two dimensions through the development of a reality-driven exposure to what an engineering education is like.

- Encouraging talented young people to select engineering as a college major. A special challenge is to attract women and minority students to engineering.
- Retaining students in engineering once they have chosen engineering as their major.

Outcome 3: Engage and Inspire

WVSGC sponsored the East Coast Computer Algebra Day, held Saturday, May 10, 2008 at Shepherd University. Nobel Laureate, John Nash, was the featured speaker. Number crunchers from across the East Coast converged at the National Conservation Training Center (NCTC) to talk math and discuss why more mathematicians should let computers do the heavy crunching. The yearly conference serves as an incubator for computer algebra-related research and draws top-notch math whizzes from institutions all over the East Coast. The free conference is held at a different place each year and is open to the general public to court would-be math, engineering and science majors.

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 projects funded in 2008 is provided below.

- WV State Fair, held August 6-18, 2008, in collaboration with NASA Langley and NASA IV&V Facility. 4,200 people visited our booth.
- Sixth Annual Undergraduate Research Day at the Capitol took place at the Capitol Rotunda. This event helped members of the State Legislature and Executive Branch understand the importance of undergraduate research by talking directly with the students. The event drew 450 visitors.
- Science Camp at Johnson Elementary School, in Harrison County, WV. 85 students and three educators participated in this event.
- WV Math Field Day. Math Field Day was developed to interest and inspire students to achieve through competition. This event had 236 participants.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- Longitudinal Tracking- Number of significant awards in FY 2008 was 241, Fellowship/Scholarships = 168 and Higher Educational / Research Infrastructure =73; 17 of the F/S and three (3) of the Research Infrastructure recipients represent underrepresented minority. The majority are still enrolled in their current programs; only two Higher Educational females have graduated. One is attending Graduate School at Georgetown University where she is majoring in chemistry and one is employed by a STEM Aerospace Industry.

For the Longitudinal Tracking (2006- 2007) the number of significant awards was 354, Fellowships/Scholarships = 276 and Higher Educational / Research Infrastructure =78; 20 of the F/S represent Underrepresented Minority students. Six are currently employed at NASA or JPL, 6 are employed in STEM non-Aero positions, 8 are employed in STEM Aerospace positions, 3 are employed in K-12 STEM academia, 8 are seeking employment in STEM fields, 23 are employed in other STEM fields, 55 are still pursuing advanced STEM related degrees.

- Course Development- WVSGC sponsored the development and offering of the following college level courses:
 - Advanced Topics in Instrumental Analysis: James Coffield, Wheeling Jesuit University.
 - Chemical Processes in Renewable Energy: Hasan El-Rifai, West Virginia University Institute of Technology.
 - Student Project Applications of Concept Engineering, Living Learning Community (SPACE LLC): Galen Hansen, Fairmont State University
 - Graduate Level Course on Optimal and Robust Control Applications in MAE: Mario Perhinschi, West Virginia University.

- Matching Funds: In 2008, we secured and documented a total of \$678,247 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: The only two HBCUs in West Virginia are members of the WVSGC. Bluefield State College is represented by Dr. Felicia Blanks and WV State University is represented by Dr. Naveed Zaman. As outlined in previous sections of this report, 7 NASA fellowships were awarded at Bluefield State College and 9 were awarded at WV State University. WVSGC also continued its funding of the Emerging Leaders Institute at Bluefield State College. Seven Research Enhancement mini-grants were awarded to faculty at WV State University. Additionally, Dr. Jose Toledo of WV State University won support for an outreach project entitled “Project Reach for the Stars (REFOST).”

IMPROVEMENTS MADE IN THE PAST YEAR

1. We adapted an on-line submission and review of all proposals submitted to WVSGC for funding. This system was designed and supported by the Space Gant Foundation.
2. We put an increased emphasis on recruitment of under-represented minorities. As reported before, we experienced a 55% increase in the number of minority students who received fellowships from WVSGC.
3. We hired a new staff member, Ms. Michele Wengryn, to help with our outreach activities, preparing grant proposals, and general office duties.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

The WVSGC consists of 7 West Virginia universities and 5 undergraduate colleges. 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 affiliates and members of the Board of Directors of the WVSGC are as follow:

- West Virginia University, largest public university in the state, Land Grant, primarily research oriented.
- Marshall University, second largest public university in the state, research oriented.
- Bluefield State College, an HBCU, primarily teaching oriented public university.
- WV State University, an HBCU, Land Grant, primarily teaching oriented public university.
- Shepherd University, primarily teaching oriented public university.
- WV Wesleyan College, teaching and research oriented private college.
- Wheeling Jesuit University, teaching and research oriented private university.
- Bethany College, teaching and research oriented private college.
- Fairmont State University, teaching and research oriented public university.
- West Liberty State College, primarily teaching oriented public college.
- WVU Institute of Technology, research and teaching oriented public university.
- 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.
- WV High Technology Consortium Foundation, non-profit organization to promote high technology and economic growth in the state.
- Polyhedron Learning Media, Inc., technology development company specializing in creating educational software, audio/video, and print materials.
- 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.
- NRAO Green Bank Facility, home to the Robert C. Byrd Green Bank Telescope, the largest fully steerable dish in the world.
- Dr. Anne Cavalier: Economic and workforce development liaison, US Dept of Commerce, Economic Development Administration
- Col. Roger Duckworth (Ret.), liaison with industry, former VP for Research at WV High Tech Consortium Foundation
- Mr. Denny Avers, Engineering Consultant, a founding member of the Consortium, then representing IBM