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 $575,000 for fiscal year 2011.

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 and other documents (such as the Strategy for American Innovation, and the Federal Science, Technology, Engineering, and Mathematics (STEM) Education Portfolio report), 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 the quality of science and math in K-12 education and teacher preparedness.
(3) To increase the participation of under-represented groups in our programs for students and faculty.

Higher Education Programs

Goal: The goal 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.

SMART objectives:

- To initiate and support programs such as the Balloon Satellite Project, Microgravity Research Program, and Lunabotics; and to participate in programs such as RockSat 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.).

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.

SMART objectives:

- 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).

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).

SMART objectives:

- 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.

Our goals and SMART objectives for Outcome 2 are listed below.

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.

SMART objectives:

- 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.

Our goals and SMART objectives for outcome 3 are shown below.

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.

SMART objectives:

- 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 2011 WVSGC provided WVSGC provided numerous opportunities for students at its academic affiliates as well as the opportunity to participate in summer internships at NASA centers and high tech companies in West Virginia. Overall 15 students (2 female, 13 male; 1 Hispanic, 4 African American, and 10 Caucasian) interned at various NASA centers or high tech companies in the summer of 2011. They represented nine academic departments and three institutions of higher education in West Virginia.

- Percentage of students whom have taken their next step and have been successfully tracked though their next step vs. last year of SG support:
    - 32% for 2006
    - 78% for 2007
    - 92% for 2008
    - 100% for 2009
    - 90% for 2010
    - n/a for 2011 – all participants are still enrolled
    - 64% for 2006-2011

- 86% of students significantly supported by WVSGC went on to next steps in STEM disciplines

The following comments of note were recently submitted to the National Space Grant Foundation (NSGF) as part of its longitudinal tracking program.

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

Space Grant has been instrumental in my professional development through my college career. I have been given the resources to find the focus of my major that I'm really passionate about and the opportunity to work and network with other professionals who can help me fulfill my dreams (Ryan Coder - on 08/23/10, 2009 West Virginia Space Grant Scholar, 2009 NASA Langley Aerospace Research Summer Scholars, 2010 NASA Langley Aerospace Research Summer Scholars, 2011 WV Space Grant Higher Education Program).

I was just accepted into a summer REU program at Johns Hopkins where I will be working at the Institute of NanoBioTechnology. After graduating next year with a B.S. in Chemistry, I plan to attend graduate school to receive my Ph.D. in molecular biology and cell biology. When applying to the REU at Johns Hopkins, I mentioned that I would be completing research through the NASA program. I believe that it really helped my chances of getting a spot; thank you very much for this opportunity (Daniel McClelland, 2011 Space Grant Fellowship-Bethany College).

It has given me continued motivation to do research as an undergraduate and helped show me the importance of that research. Being able to participate in this program is a unique experience that has enriched my life as a student, rewarded my hard work, and is an honor (Andrea Renshaw, 2011 Space Grant Fellowship-West Liberty University).

Outcome 2: *(Educate and Engage)*

WVSGC sponsored several higher education projects that benefited the Consortium students directly and prepared them for a STEM career in the future.

1. WVSGC sponsored the annual West Virginia FIRST LEGO® League state championship. This year's tournament was held Saturday for the first time at

Ripley High School and featured 36 teams and total attendance of more than 1,100. A grant from the WVSGC along with assistance from the Center for Educational Technologies at Wheeling Jesuit University made this event possible. The theme of this year's competition was Food Factor. The competitors, ages 9-14, researched food safety issues and tried to solve a contamination or spoiling problem. Then they programmed their robots to navigate a veritable contamination obstacle course during the table competition. Members of the winning MARS Rovers are Emily Lederman, Miles Nelson, Andrew Riley, Ethan Scime and Henry Vos. The team is coached by Earl Scime and Jeff Vos. The judges' notes said of the MARS Rovers, "This team is out of this world—a planet to themselves." Earning second place overall were the Virtual Vikings of Mountaineer Middle School in Morgantown. They are coached by Cathy and Brian Woerner and mentored by Jerome Pender and Stephen Woerner. Judges said, "This team explored all aspects of the competition."

2. WVSGC sponsored a team of six students to participate in the RockSat program. Under the mentorship of professors in the Physics department and Mechanical and Aerospace Engineering department at West Virginia University, built a payload that was flown in the summer of 2011 at Wallops Island. This program has enjoyed the support of an industrial partner, ATK/WV which provided independent testing of the payload before it was taken to the launch facility. Additionally, Analog Devices/Massachusetts donated payload components in excess $1,100 in retail value; Images SI, New York donated Geiger counter testing components of $75 in retail value.

3. A team of 15 students from the West Virginia University College of Engineering and Mineral Resources recently competed in their first Lunabotics Competition sponsored by NASA. The competition challenged teams from around the world to design and build a remotely controlled excavation robot that is capable of navigating obstacles, collecting, and depositing "lunar simulant" – simulated moon soil – within 15 minutes. Despite getting a late start in their planning. the team finished third in the mining competition, third in the bandwidth efficiency competition, and earned honorable mention recognition for team spirit and innovative design, winning 2nd place overall in the competition. As part of their prize, the team was invited to return to Florida or the final launch of the space shuttle Atlantis. WVU Lunabotics team is sponsored by the NASA WV Space Grant Consortium, WVU College of Engineering and Mineral Resources, and the Lane Department of Computer Science and Electrical Engineering.

Outcome 3: ***(****Engage and Inspire)*

WVSGC sponsored several public extension and outreach projects last year. A couple of those projects are highlighted below.

1. As reported by Dr. Robert Strong, Near Earth Object Foundation, for his project entitled "Urban and Rural Sky Project" there were a total of 33 student hands on

activities and 33 public at large activities. The goal of this project was to enhance knowledge of space and sky; and, to construct a better understanding of the various NASA accomplishments past, present, and extrapolated into the future. The above activities were highlighted in the *Ohio Valley Parent Magazine*, *Radio Science News* and the SMART-Center web site. He also reported the following statistics:

- Direct participants in-service educators: 52
- Direct participants pre-service educators: 31
- Direct participants informal educators/museum staff: 10
- Direct participants precollege students: 408
- Direct participants administrators: 5
- Direct participants parents/guardians: 265
- Direct participants higher education students (non- pre-service): 57
- Direct participants higher education faculty: 19
- Direct participants public at large: 87

2. Dr. Deb Hemler, Fairmont State University, reported that in her project entitled "Exploring the Universe through the Electromagnetic Spectrum" she conducted a one week workshop in June 2011 for middle school teachers. A total of 12 teachers (11 full time and 1 substitute) representing 10 WV counties were trained on NASA curricular materials and science pedagogy using the theme of Electromagnetic Spectrum. Teachers were provided materials for classroom implementation, continuing education graduate credit, a modest stipend, and room and board. The highlight of the workshop included a day of using wavelengths from the microwave band of the EM spectrum to perform ground penetrating radar (GPR) studies at Kern's Fort, a prerevolutionary built fort in Morgantown, WV. Participants also dug one shovel test pit where an old bush was to be removed. Teachers were required to implement grade and CSO appropriate lessons in their classrooms the following school year. In addition, funding was made available to those who were willing to present their developed lessons at the West Virginia Science Teachers Association (WVSTA) meeting.

PROGRAM ACCOMPLISHMENTS

Outcome 1*: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals (Employ and Educate)*

Achievements and progress related to the NASA WV SGC Fellowship/ Scholarship, Higher Education and Research Infrastructure program are listed below.

Fellowships/Scholarships: We made 135 fellowship/scholarship awards ($1,000 to $3,000 each) as well as seven (7) Undergraduate Research Fellowships (up to $5,000

each) and five (5) Graduate Fellowships ($24,000 each). Also, eight (8) students were funded as part of research grants awarded to faculty.

Of the 135 fellowship/scholarship awards at the affiliate level, 67 (50%) went to female students and 13 (10%) went to students from underrepresented groups. We also awarded three (3) scholarships to students with disabilities.

Statistics for students who have taken their next step and have been successfully tracked through their next step vs. last year of SG support are shown below.

- 170 students took next step in FY11 (SG participation supported from FY06-FY11 funds)
  - 59 are pursuing advanced degrees in STEM disciplines
  - 2 accepted STEM positions at NASA contractors
  - 65 accepted STEM positions in industry
  - 2 accepted STEM positions in K-12 academia
  - 9 accepted STEM positions in academia
  - 33 went on to positions in non-STEM disciplines

Undergraduate Research Fellowships (up to $5,000 each) are competed for at the Consortium level. Seven (7) such fellowships were awarded last year to students from the following Consortium affiliates:

Shepherd University: 1 award, 1 female, 1 Caucasian
Wheeling Jesuit University: 1 award, 1 male, 1 Caucasian
West Virginia State University (HBCU): 1 award, 1 male, 1 Caucasian
West Virginia University: 3 awards, 3 male, 3 Caucasian
West Virginia Wesleyan College: 1 award, 1 female, 1 Caucasian

Graduate Research Fellowships (up to $12,000 plus cost share of 1:1) are also competed for at the Consortium level. Five (5) such fellowships were awarded last year to students from the following Consortium affiliates:

Marshall University: 4 awards, 3 female, 1 male, 4 Caucasian
West Virginia University: 1 award, 1 female, 1 Caucasian

Breakdown of the number of students who have received direct support during the FY2011 reporting period by affiliate was as follows:

Bethany College	6
Bluefield (HBCU)	5
Marshall University	27
Shepherd University	24
West Liberty University	12
Wheeling Jesuit University	13
WV State University (HBCU)	5
WV Wesleyan College	11

West Virginia University	31
WVU Institute of Technology	1
Total	**135**

Some of the comments that were submitted to the NASA WVSGC office in response to the question: "How did participation in these programs impact your education and life?" are shown below.

- Participation in the Space Grant program was a highlight of my graduate education while at Marshall University. The granting program enabled me to expand my research in ways that would not have otherwise been possible and formed a large portion of what will become my dissertation at the end of this summer. (J. Michael Brown - on 05/24/11, 2009 West Virginia Space Grant Graduate Fellow, Marshall University - Graduate Assistant)
- The WV Space Grant provided more opportunities than I knew what to do with. They were so engaging and responsive to what my interests were. I am so thankful for their interest in my education and career path. Because of this mentorship and access to opportunities, I have found what I like and what I don't like within the Aerospace Industry. (Emily Calandrelli - on 09/20/11, 2006 West Virginia Space Grant Scholar, 2007 Summer Student Internship, 2007 West Virginia Space Grant Scholar, 2007 Microgravity Project, 2008 NASA Academy, 2008 West Virginia Space Grant Scholar, 2008 Microgravity Project, 2009 West Virginia Space Grant Scholar, Commercial Spaceflight Federation - Research Intern)
- It has opened my eyes to the aerospace opportunities that are open to me thanks to my engineering background. (Justin Cole - on 03/17/12, 2011 Lunabotics Mining Challenge, CDI Engineering Solutions - Mechanical Engineer)
- I found the program to be very valuable in real life experiences. I was able to take what I learned in school and apply it to real life situations. While working at my NASA Internship I realized that I would like to continue working with NASA in the future. (Katherine Cruse - on 07/18/11, 2011 NASA Internship, 2011 WV Space Grant Higher Education Program)
- The research experience I gained through the Space Grant program helped me enter medical school at Marshall University and I am now almost completed with my M.D. (Jeremy Cumberledge - on 08/08/11, 2006 WV Space Grant Scholar)
- Participation in the student internship program was a key part in helping me realize what I wanted to do with my education. As a systems engineer intern, I had the opportunity to integrate hardware components with supporting software on a robotic system. This gave me enough experience to decide that this was really what I wanted to do as a profession. Participation in the fellowship programs allowed me to extend my technical education through research which otherwise would not have been possible without the required support. The undergraduate research fellowship provided the groundwork for my Master's thesis, while the graduate fellowship help prepare me for the type of technical work that I expect to perform professionally. (Steven Hard - on 04/27/11, 2007 West Virginia Space Grant Scholar, 2008 Undergraduate Research Fellowship,

2008 NASA Student Internship Program, 2010 NASA/WVSG Graduate Research Fellowship Program)

- The Academy program was the best and most important internship/work experience that I have had to date! (Michael Nussbaum - on 10/25/11, 2011 NASA Academy)
- My internship led to a full time position with GST (formerly TMC). (Brad Rhoades - on 08/04/11, 2005 Summer Student Internship, Northrop Grumman - Department of Defense Next Generation Automated Biometric Identification System Test Engineer)

A few of comments in response to the question: "What role have you played in the aerospace industry since graduation?" are shown below.

- I work with all of the major aerospace companies on development of international aerospace standards for engineering design. (John Brewer - on 04/22/11, 2007 High Altitude Student Payload Project, Booz Allen Hamilton - Senior Consultant)
- My research works to identify strategies that can improve collaborations between NASA and both commercial companies and International agencies. I am working to apply an open model framework to the NASA architecture to enable this collaboration. I am currently looking at how an open model can be used to facilitate technology transfer from unused NASA technology to industry. (Emily Calandrelli - on 09/20/11, 2006 West Virginia Space Grant Scholar, 2007 Summer Student Internship, 2007 West Virginia Space Grant Scholar, 2007 Microgravity Project, 2008 NASA Academy, 2008 West Virginia Space Grant Scholar, 2008 Microgravity Project, 2009 West Virginia Space Grant Scholar, Commercial Spaceflight Federation - Research Intern - NASA / Industry partnership strategies)
- I am now an employee of Lockheed Martin Global Training and Logistics, developing training software used by all branches of the US military, including flight simulations used to train Air Force pilots. (Danielle Holstine - on 01/22/12, 2005 West Virginia Space Grant Internship, 2006 West Virginia Space Grant Internship, 2007 West Virginia Space Grant Internship, 2008 West Virginia Space Grant Scholar, Lockheed Martin Global Training and Logistics - Software Engineer)

Other "Higher Education" programs supported by WVSGC include:

Support for AIAA; support for two students to attend the NASA Connecticut Space Grant Consortium Helicopter Training Experience in New Britain, Connecticut; 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: WVSGC supports two programs in this category:

- Research Initiation Grants (RIG) 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. Three RIG's were awarded last year.
- Research Enhancement Awards are competed for at the academic 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 which they augment by an additional $6,000 from non-federal sources. 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 FY 2011 reporting period.

1. Dr. Ashish Nimbarte (West Virginia University): "Development of a biomechanical modeling method to assess upper extremity musculoskeletal loading during extra-vehicular activities." The investigator indicated that he has had successful collaboration with Dr. Rajulu and his team at the Anthropometry and Biomechanics Facility at the NASA Johnson Space Center.
2. Dr. Maria Serrat (Marshall University): "Imaging Skeletal growth plates using in vivo multiphoton microscopy." At the time of this report, Dr. Serrat indicated: "I have made excellent progress on Aim 3 of the project, primarily focusing efforts on the collection and analysis of pilot data for an extramural grant submission. My experiments use fluorescent tracers introduced into the vasculature to study effects of temperature on the arrival of molecules to growth plates of elongating bones *in vivo*. I will be presenting some of these exciting preliminary results at the Experimental Biology Meeting later this month in San Diego." She also plans to prepare a manuscript for submission to a peer-reviewed journal.
3. Dr. Andrew Cao (West Virginia University): "Nanocrystal-based Hybrid Light-Emitting Devices for High-Resolution Tactile Sensing." Dr. Cao reports that during this period, a proposal entitled "High-Sensitivity Nanocrystal-Based Hybrid Light-Emitting Tactile" was submitted to NASA Innovative Advanced Concepts (NIAC) program, but was not selected for funding. A journal paper and a conference paper have been published.

Total value of these grants was $102,934 (NASA $59,921; Cost Share $43,013)

Breakdown of the number of Research Enhancement Awards (REA) during the FY2011 reporting period is as follow:

Bethany College: 1 award (Science PI: Dr. John Burns)

Fairmont State University: 1 award (Science PI: Dr. Don Trisel)

Marshall University: 2 awards (Science PI's: Drs. Gary Schultz and Ziaojuan Fan; student involvement: 3 male undergraduate students)

Shepherd University: 5 awards (Science PI's: Drs. J. Best, R. Wojtowicz, J. Groff, S. Kim and W. Liao)

West Liberty: 5 awards (Science PI's : Drs. Evan Lau, Joe Horzempa, Mark Even, Kate Tennant and Matthew Zdilla)

Wheeling Jesuit University: 3 awards (Science PI's: Drs. Mary Railing, Bryan Raudenbush and James Coffield)

WV State University (HBCU): 6 awards (Science PI's: Drs. Michael Fultz, Genia Sklute, Gerry Hankins, Tim Tuhnke, Andrew Schedl and Umesh Reddy.)

WV Wesleyan College: 4 awards (Science PI's Drs. Thomas Brennan, Tracey Delaney and Trevor Stevens)

Total value of these grants was $117,620 (NASA $58,500; Cost Share $59,120)

Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty. (Educate and Engage)*

WVSGC has supported and implemented the following programs in direct support of Outcome 2:

College Course Development

Only the following College Course Development project was funded during the FY2011 reporting period:

- Dr. Joseph Busche, Associate Professor of Physics, Wheeling Jesuit University. "Teaching Modern Physics as a Distance Learning Course w a Synchronous Component." The initial course was taught in the spring 2012 semester. A total of five students are completing the course.

The total value of this program was $20,000 ($10,000 NASA; $10,000 Cost Share)

K–12 Professional and Curriculum Development Program

Projects supported in this category during the FY2011 reporting period were:

- 37th Annual WV Math Field Day: Math Field Day was established to promote increased student participation in classroom and extracurricular mathematics. One of the primary objectives of the math day is to demonstrate that mathematics is truly an exciting and challenging subject to study. The West Virginia Math Field Day is an individual mathematics competition ranging from grades 4-12 held in West Virginia. In 4th-9th grade, students compete within their own grade. In 10th, 11th, and 12th grades, students compete within all of the grades mentioned. This event had over 320 participants.

- Karen Kettler, West Liberty University: "B.E.E.: Biodiversity Experience for Educators." The goals of project B.E.E. were two-fold: to increase the content knowledge of both science educators and Master Naturalists regarding a largely understudied group of organisms, and to develop a synergistic relationship between secondary science educators, citizen scientists, and arthropod experts from the Carnegie Museum of Natural History, West Virginia University, and West Liberty University to obtain valuable data regarding West Virginia arthropods. There were five participants in the program. Kettler reports "Of the five participants, three were secondary educators from West Virginia, one was an informal educator who ran an environmental center, and one was a Master Naturalist (retired educator). Initially, we were discouraged at the small number of participants, but the small group created a more intimate learning environment, as there were more one-on-one interactions with the content experts."

- Joelle Spagnuolo, Big Elm Elementary: "Education through Automation – Phase 2." Spagnuolo reports: "Big Elm Elementary currently has an enrollment of approximately 700 students. The school houses classes ranging from pre-K to fifth grade. The socio-economics of the student population is very diverse however there is a majority of 53% currently receiving free or reduced lunch. The *Education through Automation – Phase 2* program was available to all students in fourth and fifth grades. There were no biases or discrimination to determine who can participate. The benefits of this program were countless. I expect that the teaching mechanisms outlined in this program will be utilized by other school organizations such as the Parent Teacher Association (PTA)."

- Elizabeth Strong, Near Earth Object Foundation: "Science Activity Enrichment Project." The project included teachers of K-8 students from Brooke, Hancock, Marshall, Ohio, and Wetzel counties in West Virginia. Thirteen in-service educators and four informal educators directly participated in this program. Participants explored forms of energy, sources of energy, energy conservation, electricity and work with new NEED materials dealing with carbon footprints, wind turbines, and alternative fuels. For this workshop, special emphasis was given to K-8 along with connections to the WV-Handle on Science kits (Magnets and Motors, Magnetism and Electricity, Sound, and Levers and Pulleys). Activities showed correlation to specific science content standards for West Virginia. Teachers were provided with activity books from Project NEED and participated in hands-on activities for K-8 during the two day workshop.

- Sarah Umphress, WVU Institute of Technology: "Rural Teacher Workshop Program: How Can We Reach a Broad Audience?" An informative Molecular Biology workshop for biology teachers was presented by Dr. Umphress and Dr. Kimberlyn Gray on June 28-29, 2011, on the WVU Tech campus in Montgomery, WV. Eight (8) teachers from different high schools in the Regional Educational Service Agencies (RESA) III and IV in south central West Virginia participated in the program. The participants enjoyed performing hands-on experiments

involving gel electrophoresis, bacterial transformation, extraction of DNA plasmids, extraction of bacterial induced protein, restriction endonuclease digestion of plasmids, followed by gel electrophoresis of the digested plasmids and the extracted proteins. A Regional Science Lending Library was created to allow the participants access to all the equipment needed to perform the experiments presented during the workshop. Thus all participants now have access to a free "lending library" to borrow equipment and supplies to perform the experiments at their schools. In addition to the hands-on activities, each participant received workbooks with teacher instructions plus student worksheets to use in their classrooms that covered all of the workshop experiments. In addition the teachers were provided with the instructions to over 35 low cost/minimal equipment experiments to perform with their students.

The total value of these projects was $50,297 ($24,924 NASA; $25,373 Cost Share)

Outcome 3: *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission: (*Achievements and progress of Informal Education programs). *(Engage and Inspire)*

In line with the original objectives of this program to be proactive in collaborating w/ various entities within the state of WV, Dr. Majid Jaridi (Director, NASA WV SGC) and Kyle Phillips (WVU MAE Graduate student) attended the 2011 "Teaming to Win" conference in Roanoke, WV. The organization's purpose is to advance and improve small business prospects in West Virginia, and to facilitate educational opportunities which promote higher business standards, methods and practices. U. S. Senator Jay Rockefeller and Dr. Anthony Cugini, the Director of the National Energy Technology Laboratory, were the event's keynote speakers. More than 300 people visited WV SGC's booth at the conference.

Formal and Informal Education Programs

NASA WV Space Grant Consortium 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 2011 is provided below.

- Deb Hemler, Fairmont State University: "Exploring the Universe through the Electromagnetic Spectrum". A week-long professional development workshop that used the electromagnetic spectrum to explore the universe by providing interdisciplinary experiences across the fields of astronomy, archaeology, technology, history, and engineering. This workshop is adaptable to the classroom, summer camps run by informal educators, or afterschool programs. Highlights included training in the use of optical telescopes, Starlab planetariums, and other astronomical tools as well as using radio waves (ground penetrating radar) to study a Revolutionary War fort site.

- Student Partnership for the Advancement of Cosmic Exploration (S.P.A.C.E.), West Virginia University, "2011-2012:A SPACE Odyssey, Reaching Out to West Virginia and Beyond"

- Kevin Rice, Marshall University: "Establishment of nanotechnology seminar series at MU". ***TE_aM^2 NANO*** launched its first seminar of the series at 6:00 p.m. on October 12, 2011 at the Holiday Inn Express Civic Center in Charleston, WV. The speaker for the event was Dr. Craig Friedrich from Michigan Technological University addressing the *"Economic Potential of the Nanotechnology Industry".* Dr. Friedrich has more than 20 years in micro and nanofabrication and is the Director of the Multi-Scale Technologies Institute at Michigan Tech. Invitations were sent well in advance through email blasts, personal contact, media advertising, posters and word-of-mouth. There were 41 attendees for this first seminar which included a mix of university faculty and students, community and technical colleges, manufacturing and private sector business professionals, economic development representatives and local small businesses. Based on all categories of a survey conducted, the seminar received an overall 87.95% positive rating, with the speaker receiving 95.54% positive rating and 87.46% positive rating on the subject content. The second ***TE_aM^2 NANO's*** seminar "*The Economic Potential of the Nanotechnology Industry on Healthcare and Biomedical Treatments"* was held on November 16, 2011 at the Marshall University Robert C. Byrd Biotechnology Center at 6:00 p.m. in Huntington WV. Dr. Arun Kumar from University of Delaware was the keynote speaker for the event. Dr. Kumar is a highly regarded research investigator and subject matter expert on nonomedical applications for diagnosis, monitoring and treatment of disease. Invitations were sent well in advance through email blasts, personal contact, media advertising, posters and word-of-mouth throughout the academic and medical communities. There were 38 attendees for this seminar which included: university faculty and students, physicians and other medical/hospital professionals, West Virginia Job Corps, manufacturing and private sector businesses, community and technical colleges, and manufacturing engineers. Based on all categories of a survey conducted, the seminar received an overall 84.14% positive rating, with the speaker receiving 90.4% positive rating and 91.4% positive rating on the subject content.

- Robert E. Strong, Near Earth Object Foundation: "Urban and Rural Sky Project"

- WV State Fair, held August 12-20, 2011 in collaboration with NASA Langley. Gate attendance: 187,000-190,000. Over 6,500 people visited WVSGC's 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.

- Annual Undergraduate Research Day (URDC) at the Capitol took place at the Capitol Rotunda, Charleston, WV. URDC allows students to present their discoveries in poster format and talk to legislators about their findings.

- Eight Grade Career Day at Mylan Park in Morgantown, WV. On April 13, 2011, over 770 eighth grade students from five middle schools in Monongalia County participated in the event. Student workbooks with occupational information and salary range were provided for each vocation attending the event. WVSGC's booth was the most popular exhibition at this event.

The total value of the above projects was $70,000 ($35,000 NASA; $35,000 Cost Share).

PROGRAM CONTRIBUTIONS TO PART MEASURES

Student Data and Longitudinal Tracking:

Total awards = 50; Fellowship/Scholarship = 12, Higher Education/Research Infrastructure = 38; 7 of the total award represent underrepresented minority F/S funding.

During the FY11 program year 59 are pursuing advanced degrees in STEM disciplines, 2 accepted STEM positions at NASA contractors, 65 accepted STEM positions in industry, 2 accepted STEM positions in K-12 academia, 9 accepted STEM positions in academia, and 33 went on to positions in non-STEM disciplines. The remaining students have not yet received the degree that they were pursuing while the received their Space Grant award.

Diversity

Two academic affiliates are HBCUs; one (1) faculty and 13 students from underrepresented groups and three (3) students with disabilities. Also, 67 of the 135 recipients of our fellowships/scholarships are female.

Minority Serving Institution Collaborations

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 2011, both institutions were active in the Consortium and participated in a number of programs sponsored by WVSGC. Five (5) NASA fellowships were awarded at West Virginia State University and 10 (including students from the Emerging Leaders Institute) were awarded at Bluefield State College. 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. Five students from the ELI were awarded summer internship to conduct undergraduate research under the supervision of Dr. Tesfaye Belay at Bluefield State. In FY 2011 we provided $15,000 to support these summer student internships and a stipend of $5,000 to Dr. Belay.

NASA Education Priorities

WVSGC initiated and sponsored several programs that provided hands-on student experiences. Examples of these programs include:

- AIAA Design Build Fly, West Virginia University/ Department of Mechanical and Aerospace Engineering. The West Virginia University Unmanned Aerial Vehicle Team sponsored by the NASA WVSGC participated in the annual AIAA Design, Build, Fly competition sponsored by the American Institute of Aeronautics and Astronautics (AIAA) Cessna Aircraft, and Raytheon Missile Systems. The 2011 competition was held at TIMPA Field in Tucson, AZ on the weekend of April 15-17, 2011. The contest theme was a "Soldier Portable UAV". The airplane had to fit in a commercially available suitcase meeting airline carry-on requirements. The WVU team consisted of 14 students ranging in class rank from sophomores to seniors all full time students at the Statler College of Engineering and Mineral Resources.

- NASA ESMD Lunabotics Competition: WVSGC, in collaboration with the Statler College of Engineering and Mineral Resources at WVU, fielded a 15-member team to compete in the second annual Lunabotics Mining Competition, sponsored by NASA ESMD. The team, which was composed of six graduate students and nine undergraduates in computer and electrical engineering, as well as mechanical and aerospace engineering, competed against other university-level teams at the Kennedy Space Center in May 2011.

- RockSat: WVSGC sponsored a team of six students to participate in the RockSat program. Under the mentorship of professors in the Physics department and Mechanical and Aerospace Engineering department at West Virginia University, built a payload that was flown in the summer of 2011 at Wallops Island. This program has enjoyed the support of an industrial partner, ATK/WV which provided independent testing of the payload before it was taken to the launch facility.

- Helicopter training program by Connecticut SGC: Two WVU Engineering students, Alan Didion and Zachary Merceruio attended the NASA Connecticut Space Grant Consortium Helicopter Training Experience in New Britain, Connecticut on the campus of Central Connecticut State University.

Additionally, WVSGC sponsored several programs to benefit and engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise. Examples of such programs include:

- "Urban and Rural Sky Project" by Dr. Robert Strong of the Near Earth Foundation. This project, which was sponsored by WVSGC, impacted 31 pre-service teachers and 408 pre-college students.

- The project "Exploring the Universe through the Electromagnetic Spectrum" by Dr. Deb Hemler of Fairmont State University had a direct impact on 12 in-service teachers.

- The 2011 Summer Aviation Camp, which was co-sponsored by WVSGC and the Mid-Atlantic Aerospace Complex, provided exciting hands-on experience to 48 pre-college students during a 3-day camp on the campus of West Virginia University. Astronaut Jon McBride inspired our campers with his presentation and participation on the last day of the camp.

IMPROVEMENTS MADE IN THE PAST YEAR

- Addition of a new Industry Partner: Mr. Wade Linger, President and CEO of TMC, Inc., attended the fall 2011 meeting of the NASA WV Space Grant Consortium/NASA EPSCoR and presented his company's application to join WVSGC as an industrial partner. After serving in the Air Force, Mr. Linger began working as a defense contractor for ManTech International Corp., where he wrote and maintained computer software used by the U.S. Navy to track aircraft maintenance and parts and pilot flight hours. Trained as a computer programmer while serving in the U.S. Air Force, Mr. Linger spent much of his professional career in the fields of technology and research, including a stint as the first vice president of research for the WV High Technology Consortium. He later established TMC Technologies, an information technology company which had grown to over 80 high tech employees when it was acquired in 2005. Mr. Linger has been a community leader and volunteer. He is former chairman of the Marion County Chamber of Commerce and a former Boy Scout leader. In 2008, Mr. Linger was appointed by Governor Joe Manchin III to a nine-year term on the West Virginia Board of Education. He is currently serving as the President of this Board.

- At the fall 2010 Board of Directors meeting discussed the evaluation process and submission process for FY 2011-12 awards. Active discussion and deliberation from members of our Board ensued which resulted in an improved proposal evaluation criteria and procedures thus creating a seamless review of our 2011-12 applications.

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. Fred King
- 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. Paul Steranka
- 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 , 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 Mr. Marcus Fisher
- 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