Nevada Space Grant Consortium
Nevada System of Higher Education/ Desert Research Institute
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Affiliates:

Desert Research Institute, Great Basin College, Nevada State College, Southern Nevada College, Truckee Meadows Community College, University of Nevada Las Vegas, University of Nevada Reno, Western Nevada College

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 Nevada Space Grant Consortium is a Capability Enhancement Consortium funded at a level of $410,00 for fiscal year 2007 with an additional $306,000 provided by matching state funds administered through Nevada's System of Higher Education (NSHE) state-wide projects office.

Program Relevance to NASA:

Space Grant consortia build human capital and research expertise to support NASA's programs and missions, expand NASA's expertise and educational networks, and bring knowledge and awareness of space to a broad range of constituents in every state. The Nevada Space Grant Consortium (NVSGC) presently emphasizes building workforce and research expertise in areas of astrophysics, planetary geology and geophysics, aeronautical engineering, materials sciences and astrobiology.

Program Benefits to the State:

The Nevada Space Grant Consortia's programs supports NSHE students that are engaged in pursuing careers in areas that utilize science, technology, engineering and math (STEM) skills. Support of these students helps develop

and fulfill Nevada's skilled workforce. Additionally, the NVSGC's higher education and research infrastructure programs stimulates and supports the development of advanced training curricula within its member institutions and promotes technology development through the promotion of research activities. The combination of these activities are used in the promotion and attraction of students into NSHE institutions and fosters interactions between the state's higher education institutions, industry and NASA.

Program Goals:

The mission for the Nevada Space Grant Consortium's mission is to *create and expand opportunities for Nevada students and faculty to be active participants in NASA aeronautics and space programs. We support the national agenda to develop a strong math, science, engineering and technology education base through the funding of research and higher education programs, supporting students in internships and partnering with industry and local government.* Nevada's Space Grant Consortium is achieving this mission by targeting hands-on workforce training and research in the strategic areas of astrobiology, astrophysics, planetary geology and geophysics, and engineering. These targeted areas leverage and build upon Nevada's institutional programs and Nevada's natural resources. Thus, all of Nevada's Space Grant activities are aimed at the education and employment steps in NASA education portfolio and develop the nation's workforce that will enable NASA's overall strategic science and implementation plan for missions to the Moon, Mars and beyond.

The specific goals for 2007 that support Nevada's mission are listed as follows:

1. Develop the capacities of the Nevada students and faculty to participate in or host regional, national and/or international science or engineering university competitions.

2. Increase the number of applicants for internships and academy positions at NASA centers- the aim being to maintain or increase the number of interns and academy participants from Nevada.

3. Formalize industrial partnering relationships with our industrial affiliates to include more competitive opportunities for internships, externships and student interactions with industry.

4. Establish new courses/curricula within the NSHE institutions- specifically targeting senior design courses and senior research projects in Robotics Engineering, Planetary Remote Sensing, Astrophysics and Astrobiology.

5. Increase the number of applicants and awardees from underrepresented groups such that our scholarship and fellowship, higher education and research infrastructure

building programs are representative of the ethnic profile of Nevada (20% under underrepresented groups and 40% women).

Program Accomplishments:

The NVSGC has had an extensive and broad-based affect on campuses across the state. Specifically, the NVSGC has successfully administered fellowship and scholarships in 2007, developed and supported new student internship programs at both NASA as well with Industrial Affiliates, supported and run student teams that have competed in engineering and science competitions and developed new curricula for engineering students during the past year. These accomplishments are a result of pursuing our yearly goals and the success of these activities are highlighted by the active support and engagement of over 70 students that have had many meritorious and varied accomplishments that are highlighted below. Nevada continues to strive to increase participation of underrepresented groups in NSHE and NVSGC programs- yet the numbers in this regard remain below the targets for 2007. Efforts in 2007 that have led to recent partnering with Tennessee State University (a minority serving institution) and recent successful engagement of students in the local chapters of the National Society of Black Engineers (NSBE) and the American-Indian Engineering Society (AIES) will allow our goals for engaging and supporting a diverse workforce to be further advance.

Student Accomplishments:

NVSGC supported graduate students and undergraduate students conducted infrared experiments at high pressure (~5 GPa) and high temperature (~500 K) on cyclohexane at the U2A beamline at the National Synchrotron Light Source. The student teams also studied benzene at high pressure using x-ray Raman spectroscopy at the 16 ID-D beamline of the Advanced Photon Source. This was the first measurement of its kind ever performed for a hydrocarbon and a paper reporting these results has been accepted in the *Journal of Physical Chemistry*. Additional experiments are being conducted regarding radiation-induced damage of graphite and benzene using energy-dispersive x-ray diffraction techniques at the 16 BM-B beamline at the Advanced Photon Source. This workforce development program is one that involves a number of students at different levels of training in hands-on experience with advanced physics instrumentation and applications.

NVSGC supported a combined engineering and science team to compete in the Mars Societies inaugural University Rover Challenge competition held in UTAH at the Mars Societies Mars Desert Research Station. The UNR team won the inaugural competition by being the only rover able to successfully deploy the radio repeater in a location that would expand communications to the target area. Additionally, the UNR team was able to conduct the most thorough analysis of

the numerous scientific sites. As the winner, the UNR team was presented with a trophy at the 10th Annual International Mars Society Convention, held August 30 –September 2, 2007 in Los Angeles. Nevada is competing again in 2008.

UNLV Masters student, Nagamani Kalla, developed a meshless method model that was ideal for calculating velocities and pressure distributions over airfoils, leading to lift and drag profiles. The model was developed and defended through her MS thesis on November 16 which was quickly followed by journal publication within two weeks (the fastest paper publication Dr. Pepper has experienced). The work by Kalla has laid the groundwork for her model to be used by another student (Louis Dube) to design and built a solar-powered UAV at UNLV.

NvSGC supported a student project led by- Ryan R. Hopkins (undergraduate), who is building a synthetic muscle in a robotic arm. The robotic arm is made out of active fibers- active fibers being and area of research and development closely aligned with NASA's work on materials and their use in robotic exploration of planets (e.g. Dr. Yosi Bar-Cohen's work at JPL). UNR students are targeting competing in the Robotic Arm Competition which will be held at NASA/JPL in March 2008.

The NVSGC supported NevadaSat program continued to make significant strides in the engagement, and education steps in developing the nations technical workforce that can support NASA's missions. In 2007, NevadaSat program conducted nine balloonsat launches and competed in the ARLISS competitions. All of the NevadaSat activities (competitions and balloon launches) are high-risk from the students' perspective in the sense that there are no second chances. This type of activity requires extensive planning and teamwork and our observation is that our students consistently rise to the occasion and work well as a team, with effective planning and execution. On August 18, 2007 a team set a new altitude record for NevadaSat – 97,000 feet. The photos gained during that mission were taken when visibility was well over 200 miles in all directions. Several major landmarks were visible in the high altitude photos including: Pyramid Lake, Reno, Lake Tahoe, Honey Lake, Mt. Shasta, and Mt. Lassen. Although the balloon launching activity was not a formal competition- it was evident that a "prize" was gained not only by breaking a local record but also by gaining new and inspirational views of Nevada's local geology, a view of the overlying atmosphere and a glimpse into space. The anecdotal quote illustrating the value of the activity was evident when one student commented "This is the most exciting thing I've ever done in school." NevadaSat now has over 45 students in various Space Grant activities, with over 25% of the students being female and/or underrepresented minorities. The NevadaSat program encompasses and engages students from not only UNR but also UNLV, TMCC and SNC- making it a truly statewide activity.

In the summer of 2007 the NVSGC developed and supported a summer internship with our industrial affiliate Digital State Solid Propulsion Systems (DSSP). DSSP is a private sector contractor with contracts to NASA and the Department of Defense for the development of propulsion and miniature

guidance systems. Jonathan Beuscher of UNR worked at the hosting company during the summer of 2007 on composite constructions of nose cones, airframes, payload bays and fins using carbon, kevlar, and fiberglass. Following the internship period, J. Breuscher was hired at DSSP as a part-time materials science specialist while he continued his undergraduate work. One of the additional outcomes of this internship was the hiring of an additional student from UNR's chemistry department by DSSP. The connections were made to this student by J. Breucher's gained knowledge of DSSP's workforce needs and knowledge of a fellow student's expertise at UNR. These activities serve to train and fulfill NASA's distributed workforce as well as support economic development in the State.