

## **NC Space Grant Consortium**

### **NC State University**

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Affiliate Members: Appalachian State University, Duke University, Elizabeth City State University, NC A&T State University, NC Central University, UNC-Asheville, UNC-Chapel Hill, UNC-Charlotte, UNC-Pembroke, Winston-Salem State University

### **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 NC Space Grant Consortium is a Designated Consortium funded at a level of \$590,000 for fiscal year 2007.

### **PROGRAM RELEVANCE TO NASA**

Space Grant consortia build human capital and research expertise to support NASA 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.

Member institutions within the NC Space Grant consortium work synergistically with NASA centers to cultivate a diverse STEM workforce by engaging and supporting faculty and student in innovative, hands-on aero/space related research. The quality and breadth of NASA-funded efforts are diverse, with over 100 faculty members actively participating in NASA funded research, education and public service projects at NC Space Grant member institutions. These projects involve interactions with all nine NASA centers, the Jet Propulsion Laboratory and NASA Headquarters and support the strategic needs of all four NASA Mission Directorates as follows:

Aeronautics Research: Advanced composite materials, aircraft safety and noise reduction.

Exploration Systems: Sensor platforms, robotics, human factors, microgravity plant growth, carbon dioxide reclamation, orbital analysis and design

Science: Astronomy, weather monitoring and prediction, environmental protection, carbon and water cycle, regional climate studies, protein crystallization, and remote sensing instrumentation.

Space Operations: Pre-breathe protocols for EVA, microgravity induced muscle atrophy, bone loss in microgravity and dust contaminant mitigation.

### **PROGRAM BENEFITS TO THE STATE**

Over the past decade, NC has suffered from dwindling agricultural revenues and a changing economic base as the textile and furniture industries have eliminated jobs and closed manufacturing plants throughout the state. As a result, NC has looked to other economic sectors to boost its economy.

The aero/space industry is an emerging sector in the state and will play a major role in providing thrust to the economy. NC has the infrastructure and innovative partners in place, but needs to increase the

production of a highly skilled workforce that will meet the needs of the aero/space industry. NC Space Grant plays a critical role in the recruitment and development of the aero/space workforce by providing support for research experiences and academic advancement.

## **PROGRAM GOALS**

NC Space Grant goals are established in the areas of: Fellowships and Scholarships; Higher Education; Research Infrastructure; and Informal Education and Public Outreach. A common thread throughout each goal is to expand programs to more citizens of North Carolina, and involve women, underrepresented minorities, and persons with disabilities.

### *Fellowships and Scholarships*

Provide opportunities for students in science, technology, engineering and math (STEM) disciplines to engage in hands-on, aero/space related research projects with an emphasis on networked collaborations within the consortium, NASA research facilities and shared facilities such as the Pisgah Astronomical Research Institute.

### *Higher Education*

Engage students in STEM related internships with NASA and industry partners. Develop sustainable interdisciplinary and/or distance learning courses that are focused on enriching student understanding of complex aero/space issues. Enhance pre-college and in-service educator knowledge of aero/space issues through professional development workshop and training opportunities.

### *Research Infrastructure*

Strengthen North Carolina's aero/space-related research infrastructure by providing startup funding to university personnel who are conducting research that is directly aligned with NASA's priorities and who have either yet to become established researchers or are pursuing a significant change in research direction. Facilitate research collaborations between NC Space Grant member institutions and NASA field centers.

### *Informal Education and Public Outreach*

Enhance informal educator knowledge of aero/space issues through professional development workshop and training opportunities through venues such as museums, science centers, and civic groups. Increase awareness of the role of STEM in aero/space research and space exploration to the general public.

## **PROGRAM ACCOMPLISHMENTS**

Below are 2007 highlights of programmatic activities supported by NC Space Grant:

### *Fellowships and Scholarships*

- NC Space Grant partnered with the LORD Corporation to offer an internship program during summer 2008. The NC Space Grant/Lord Corporation Summer Internship Program will provide support for up to 4 undergraduate or graduate students (pursuing degrees in STEM disciplines) to participate in a 10-week internship at Lord Corporation's world headquarters campus in Cary. *LORD is a worldwide leader in adhesives and coatings, vibration and motion control, and magnetically responsive technologies. Operating from world headquarters in Cary, NC, LORD has 17 manufacturing facilities in nine countries and 90 strategically located sales and support centers worldwide.*
- The first NC Space Grant/ J. Donald Cline Astronomy Scholarship was awarded in 2007 to Mr. Justin Ritchie, senior in electrical engineering at UNC-Charlotte. Justin presented his 2007 summer research work at the 211th meeting of the American Astronomical Society in Austin, Texas in January 2008. *The NC Space Grant/ J. Donald Cline Astronomy Scholarship (value of \$28,000) was established in to provide two-year academic support for an undergraduate student pursuing a degree in the astronomical or related*

sciences at a NC Space Grant member university. The scholarship gives the student an opportunity to engage in hands-on research at the Pisgah Astronomical Research Institute (PARI) in western North Carolina.

- In 2007, NC Space Grant sponsored 23 of its students (Undergraduate Research Scholars and Affiliate supported students) to participate in the State of NC Undergraduate Research and Creativity Symposium (SNCURCS). Students were invited to join the Campus Executive Board and Advisory Board for a special recognition dinner on the eve of the symposium. This dinner gave students the opportunity to interact with faculty and professionals to learn about opportunities for employment and graduate education. *SNCURCS is an annual student symposium that recognizes the research scholarship and entrepreneurial talents of undergraduate students in NC. Participants represent all 53 state and private college and universities and 58 community colleges of NC.*

#### *Higher Education programs*

- Dr. John Chadwick, an Assistant Professor in Geological and Environmental Remote Sensing at UNC-Charlotte, received support from NC Space Grant to implement a special topics undergraduate course in Space Ballooning. The UNC-C 'SkyMiner' near-spacecraft flew on its maiden voyage in 2007. Dr. Chadwick's long-term plan is to make this a state-wide activity.
- Dr. Elva Jones, NC Space Grant Campus Director at Winston-Salem State University, provided supplemental support in the development of higher education curricula at the university. The 'Space Science Option', an optional component of the Computer Science major, provides students the opportunity to enroll in astronomy, special topics research, and aerospace related military science courses.
- NC Space Grant provided funds for the Morehead Planetarium and Science Center to implement Project OBSERVE (Observation Based Student Experience in REsearch Via Exploration). Project OBSERVE allows North Carolina high school students to become astronomers by using remote, robotic telescopes controlled via the internet. In 2007, high school earth/environmental science and astronomy teachers were trained to implement Project OBSERVE by learning observational astronomy, remote telescope control, and image processing. Teachers will utilize that training to bring OBSERVE to their classrooms, where students can control an array of six telescopes located in Chile. Run by the Department of Physics and Astronomy at UNC-Chapel Hill and known as PROMPT, these telescopes provide students with a unique opportunity to do hands-on astronomy.

#### *Research Infrastructure*

- Dr. Catherine White, an Assistant Professor of Biology at NC A&T State University, received NC Space Grant support to conduct research on the effects of gravity on the growth rate of bacteria in the human body. A key strategic goal in NASA's vision for space exploration is for humans to safely explore beyond Earth's orbit. Therefore, an extensive understanding of the impacts of long-term spaceflight on disease-causing microorganisms that inhabit the human body is vital. The focus of her work is to determine the effect of simulated micro- and hyper-gravity on the growth rate of specific human pathogens.
- Faculty and students at UNC-Chapel Hill received NC Space Grant funds to support astronomical research efforts. The general area of emphasis for research by students and faculty was on the evolution of spiral galaxies – both external galaxies and our own Milky Way galaxy. This work gave students the opportunity to engage in astronomical research that is directly connected to NASA astronomy missions, primarily NASA's space-based observatories (Rosat, Sptizer and Chandra).

#### *Informal Education and Public Outreach*

- Over the past six years undergraduate students from UNC Pembroke have participated in NASA's Reduced Gravity Student Flight Opportunities Program. As part of this project the students perform experiments onboard NASA's microgravity research aircraft. In addition to performing research the students also conduct a vigorous public outreach program. The team, known as The Weightless Lumbees, has always had at least 50% American Indian representation from the local Lumbee Tribe.

NC Space Grant supports outreach presentations across North Carolina to middle and high school youth.

## **STUDENT ACCOMPLISHMENTS**

Below are 2007 highlights of student activities supported by NC Space Grant:

- One hundred and eighteen awards were provided to students through NC Space Grant or its affiliates; of these awards, 33% went to students from historically underrepresented groups.
- Of students receiving NC Space Grant support in 2006 and 2007, 89% went on to pursue advanced STEM degrees or are employed in STEM disciplines. Of these, 28% went on to pursue an advanced STEM degree, 49% secured employment in STEM positions at non-NASA contractors, 6% were employed by NASA contractors, and 6% were employed at NASA. The remaining 11% of students are employed in non-STEM disciplines.

*Quotes from 2006 and 2007 Fellowship and Scholarship recipients:*

- According to Jeremy Yager, a 2006 Space Grant participant currently working as an Associate Engineer at NASA/JPL, stated that his experience with Space Grant was “career-defining” and “directly led to a full-time job” at NASA/JPL. At JPL he has been involved with the design of analog and mixed-signal electronics intended for use in aerospace applications.
- “Through the NC Space Grant’s funding of my summertime research at NASA Langley, I was able to obtain real work experience and familiarity in the field of Hypersonics. This directly impacted my marketability when applying for a career within that field in the aerospace industry. I now use and hone the basic knowledge and skills started at Langley working at my daily job.” (Nolan Halliday, 2006 Scholarship recipient, Pratt & Whitney Rocketdyne – Associate Aerothermal Engineer)
- “The NASA Space Grant program has allowed me to establish myself as a key researcher in autonomous soaring technologies, currently under investigation by only a few professionals worldwide. The NASA Space Grant funding allowed me to quickly climb over the learning curve of miniature UAV autopilots and focus on integrating new ideas and new developments.” (Dan Edwards, 2007 Fellowship recipient, Naval Research Laboratory – Controls Engineer)
- “Receiving the NC Space Grant Undergraduate Research Scholarship has truly been the defining experience in my education to date. Through the Research Scholarship, I have realized my capabilities and redefined my aspirations. Thank you for such a wonderful opportunity and I hope the same opportunity can be extended to many other students.” (Monica Overstreet, 2006 Scholarship recipient, NC State University – graduate student)