



The Outer Limits



North Carolina Space Grant Consortium

Member of the NASA Space Grant College and Fellowship Program

- ◆ Duke University ◆ North Carolina A&T State University ◆ North Carolina Central University ◆
- ◆ North Carolina State University ◆ University of North Carolina-Chapel Hill ◆
- ◆ University of North Carolina-Charlotte ◆ University of North Carolina-Pembroke ◆
- ◆ Winston-Salem State University ◆

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Space Day...A Joint Effort NC Central University and NC Space Grant Consortium

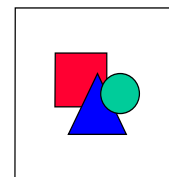
Annual NC Space Grant Consortium Space Day Conference.

Affiliate Member, NC Central has hosted for the past three years a half-day symposium on Space Science and Technology. The symposium which began in November 1997 under the sponsorship of NC Space Grant and NC Central University is held annually. The primary objective of the Symposium is to emphasize the recent developments in space science and technology and to highlight career opportunities for future scientists and engineers. The target group is the 10-12th grade students enrolled in the local high schools and their respective science teachers, as well as those undergraduate students currently enrolled in member institutions of the Consortium. The Conference is open to the public, and news media are in attendance. The 1997 Conference topic was **"Beyond the Earth—A Journey to the Future."** Presentations were made by representatives of NASA, NC Space Grant Consortium faculty and

students, University of Michigan, and NC Central University.

The 1998 topic was **"Mother Earth, Global Warming, and Life under Microgravity."** NC Central Foundation and Custom Molder, Inc, a minority owned company located in Durham were also co-sponsors. Speakers included Dr. Howard Phillips, Professor of Electrical Engineering at UNC-Charlotte, who presented a report on extensive field work on "Native Indian Education Initiative," which was supported through NCSGC; Dr. Chris Brown from NSCORT and Dynamac Corporation; and Mr. Lee Beck from US Environmental Protection Agency. Students from NC State and NC A&T State also presented their NC Space Grant sponsored research on microgravity. The 1999 Conference topic was **"Space Age Education-Space Technology to the Classroom."** The Roles of NC Space Grant Consortium for the Enhancement of its Science Education. Featured speakers were Mr. Edwin J. Prior, Deputy Director, Office of Education, NASA Langley Research Center, Dr.

Staley P. Jones, Aerospace Education Specialist, Oklahoma State University, Stillwater, OK, and Dr. Thomas Krakauer, President, NC Museum of Life and Science.



US Congressman David Price delivers the opening speech at the November 1999 symposium

Presentations were made by representatives of NASA, NC Space Grant Consortium faculty and students, University of Michigan, and NC Central University. The opening speech was given by US Congressman David Price. Approximately 200 students and teachers participated in these conferences. Space Consortium scholarship and fellowship recipients also present their research process and participate as contributing speakers. Our goal is to expand this annual conference to include the entire state and top-level NASA educational and industrial speakers. ◆

SPACE GRANT NEWS

Message from the Director

I am very pleased to report that the NASA Space Grant to the NC Consortium has been renewed for five more years, effective March 1, 2000. Our ten-year self-evaluation report was reviewed and we were ranked 4th out of 14 Program Capability States. My thanks are extended to the seven other University Directors for their assistance in preparing the report.

Our initial Advisory Council has been appointed and they are listed below. We are very pleased to have this prestigious group work with us in developing programs which are important to the State of NC and the nation.

We now have five affiliate members, listed below, with several others pending. They will provide valuable interactions to our Consortium and we welcome them aboard.

To celebrate the 100 years of flight since the Wright Brothers first powered flight in 1903, the NC Space Grant Consortium is working with the NC First Flight Centennial Commission, Dept. of Aviation in NC DOT, NASA Langley Research Center, and the AIAA Evolution of Flight Committee in planning numerous activities leading up to December 17, 2003. One of the events is an international symposium, "They Taught the World to Fly: The Wright Brothers and the Age of Flight", to be held October 22-25, 2001 at NC State University's McKimmon Center.



There are many exciting events taking place in NC and I look forward to working with all of you to help our Consortium provide services and information on Aeronautics and Space throughout NC and the nation. ♦

Fred R. DeFametta

NC Space Grant Advisory Council

Dr. Victoria Franchet Haynes

President, Research Triangle Institute
Research Triangle Park, NC

Dr. Thomas Krakauer

President and CEO, NC Museum of Life and Science
Durham, NC

Dr. Russ Lea

Interim Associate Vice President for Research
and Director of Sponsored Programs
UNC-General Administration
Chapel Hill, NC

Dr. Lane Miller

Director of Mechanical Research Development, Lord Corporation
Cary, NC

Dr. Samuel E. Massenberg

Director, Office of Education, NASA Langley Research Center
Hampton, VA

Ms. Jane Patterson

Executive Director, NC Board of Science and Technology and
Senior Advisor to the Governor for Science and Technology
Raleigh, NC

Ms. Mary Sandy

Director, Virginia Space Grant Consortium
Hampton, VA

Mr. William H. Williams, Jr.

Director, NC Department of Transportation, Division of Aviation
Raleigh-Durham Airport, NC

NC Space Grant Consortium Affiliate Members

The NC Space Grant Consortium welcomes interested businesses, industries and other organizations to join the Consortium as Affiliate Members. The Consortium can aid the Affiliate in tapping the resources of the National Space Grant network of more than 700 institutions of higher education, aerospace organizations, and government agencies. The Consortium offers to facilitate direct access to faculty, students, and staff at our member academic institutions and at our member nonprofit organizations. The Consortium makes no financial requests of its Affiliates except those agreed to for joint projects in which the Affiliate seeks to participate. Such projects could include, but are not limited to, research, education, or projects conducted jointly by Affiliate personnel and faculty at a Consortium member institution of higher education; student scholarships, student or faculty internships at the Affiliate Institution; or other jointly agreed upon activities for the mutual benefit. ♦

Affiliate Members

CargoLifter, Inc.
Lord Corporation
3TEX, Inc.
Varigeowing
Research Triangle Institute

Undergraduate and Graduate Student Fellowship Awards



1999 Undergraduate Awards

Kevn Croussore, \$4,000
 Advisor: Dr. Daniel Kilper
 UNCC, Physics

Wendell Futrell, \$4000
 Advisor: Dr. Atanas Radenski
 WSSU, Computer Science

Archana Mehta, \$4000
 Advisor: Dr. Larry Silverberg
 NCSU, Mechanical & Aerospace Engr.

Joseph Norris, \$4000
 Advisor: Drs. Griff Bilbro & Ndaona Chokani
 NCSU, Mechanical & Aerospace Engineering

Andrew Nyabnari, \$4000
 Advisor: Dr. Shawn Sendlinger
 NCCU, Chemistry

John Jefferey Freeman, \$4,000
 Advisor: Dr. Fuh-GwoYuan
 NCSU, Physics

2000 Undergraduate Awards

John Craven, \$4,000
 Advisor: Dr. Atanas Radenski
 WSSU, Computer Science

Gerald Dash, \$2,000
 Advisor: Dr. Frederick Ferguson
 NCAT, Mechanical Engineering

Benjamin Frazier, \$2,000
 Advisor: Dr. Robert Tyson
 UNCC, Electrical Engineering

Blaine Levedahl, \$2,000
 Advisor: Dr. Larry Silverberg
 NCSU, Mechanical & Aerospace Engineering

Jennifer Odynski, \$4,000
 Advisor: Dr. Ndaona Chokani
 NCSU, Mechanical & Aerospace Engineering

Joseph Reynolds, \$4,000
 Advisor: Dr. Kinney Kim
 NCCU, Physics

Miriam Riner, \$4,000
 Advisor: Dr. Charles Harman
 DUKE, Electrical Engineering

John Shelton, \$4,000
 Advisor: Drs. William Craft & Ajit Kelkar
 NCAT, Mechanical Engineering

Sandra Straw, \$4,000
 Advisor: Dr. Nina Allen
 NCSU, Botany

1999 Graduate Awards

Kristi Dendy, \$5000
 Advisor: Dr. James Rose
 UNCCH, Physics & Astronomy

Rachel King, \$5000
 Advisor: Dr. Ndaona Chokani
 NCSU, Mechanical & Aerospace Engineering

Michael Worsham, \$5000
 Advisor: Dr. Charles Hall
 NCSU, Mechanical & Aerospace Engineering

2000 Graduate Awards

Mary Brewer, \$5,000
 Advisor: Dr. Bruce Carney
 UNCCH, Physics & Astronomy

Alan Calder, \$5,000
 Advisor: Dr. B.G. Sherlock
 UNCC, Electrical Engineering

F. Donald Caulfield, \$5,000
 Advisor: Dr. Gregory Buckner
 NCSU, Mechanical & Aerospace Engineering

Kevin Croussore, \$5,000
 Advisor: Dr. Daniel Kilper
 UNCC, Physics

Meredith Drosback, \$2,000
 Advisor: Dr. Charles Johnson
 NCSU, Physics

Jason Eleson, \$5,000
 Advisor: Dr. Timothy Bralower
 UNCCH, Geological Sciences

Jeremy Harrison, \$5,000
 Advisor: Dr. Mark Schulz
 NCAT, Mechanical Engineering

Keisha Leach, \$5,000
 Advisor: Dr. Yogendra Kakad
 UNCC, Mechanical Engineering

Chris McAvoy, \$500
 Advisor: Dr. Charles Hall
 NCSU, Mechanical & Aerospace Engineering

Joseph Norris, \$5,000
 Advisor: Dr. Ndaona Chokani
 NCSU, Mechanical & Aerospace Engineering

Jennifer Price, \$5,000
 Advisor: Dr. Ndaona Chokani
 NCSU, Mechanical & Aerospace

Brian Stack, \$5,000
 Advisor: Dr. A. Homaifar
 NCAT, Electrical Engineering

Faculty Grant Awards

Research Seed Grant Program

Dr. Gregory Buckner

North Carolina State University
Mechanical & Aerospace Engr., \$3,866
Trans-Permanent Magnet (T-PM) Actuators for Space Antennas

Dr. Robin Coger

University of North Carolina-Charlotte
Mechanical Engineering, \$5,000
Method of Survival of Sub-Surface Bacteria In Frozen Environments

Dr. Eric Davies

NC State University
Botany, \$5,000
Assay of Fluctuations in Cy50plasmic Calcium in Space-Crown Plants

Dr. Ashok Gopalathnam

North Carolina State University
Mechanical & Aerospace Engr., \$5,000
Performance Enhancement for Low Reynolds Number Airfoils Using Flow Control

Dr. Daxing Han

University of North Carolina-Chapel Hill
Physics & Astronomy, \$2,500
Characterization of Amorphous Silicon Solar Cells by Using Luminescence Spectroscopy

Drs. Len Holmes and Siva Mandjiny

University of North Carolina-Pembroke
Chemistry & Physics, \$5,000
Crystallization of Recombinant Canavalin Protein

Dr. Irvin Jones

University of North Carolina-Charlotte
Engineering Technology, \$5,000
An Algorithm for Autonomous, Fault Tolerant Control of Real-Time Systems

Dr. James Oliver

University of North Carolina-Charlotte
Biology, \$5,000
The Viable But Nonculturable State in Deep-Subsurface Bacteria

Dr. Lawrence Virgin

Duke University
Mechanical Engineering, \$5,000
Inflatable Antennas for Space Applications

Dr. Fen Wu

NC State University
Mechanical & Aerospace Engr., \$2,500
Robust, Fixed-Structure CMG Momentum Manager Design

Higher Education Grant Program

Dr. Chris Brown

North Carolina State University
Botany, \$1,000
Involving Expert Lecturers in "Space Biology" (BO 277) Using Video Conferencing

Dr. Fred DeJarnette

North Carolina State University
Mechanical & Aerospace Engr., \$2,000
Design, Build, and Fly a Mars Airplane

Dr. Yvonne Goolsby-Spencer

North Carolina Central University
Nursing, \$2,000
Space Science Seminar: Higher Education Instructional Material

Outreach Grant Program

Ms. Rebecca Caldwell

Winston-Salem State University
Computer Science, \$2,000
Science and Mathematics Technology Adventures for Teachers (SAMTAT)

Drs. Jose D'Arruda and Len Holmes

University of North Carolina-Pembroke
Chemistry & Physics, \$2,000
Space Science Seminar Series Employing Internet and Television Technology

Dr. Kinney Kim

North Carolina Central University
Physics, \$2,000
NC Space Grant Consortium and Public Service 2000 Symposium on Space Science and Technology

FEATURED SPACE GRANT PROJECTS

NASA Academy. The Consortium participates in the NASA Academy program to provide undergraduates and graduate students internship opportunities in engineering, science, and mathematics at a NASA Field Center. Students from member institutions compete by submitting a written application through NC Space Grant. NCSGC provides selected students with stipends of up to \$4,000 each. Jeff Freeman from NC State University was chosen by Goddard Space Flight Center for the 1999 Summer program at the Academy. As a physics major, Jeff's project was entitled "Mixed-Mode Fracture Characteristics of Stitched Warp-Knit Carbon Composites". ♦



Jeff Freeman (center) receives an award from Drs. Gerald Soffen and Joseph DiRienzi from NASA Academy at Goddard Space Flight Center.

International Master's Degree in Aerospace Engineering Program. With four US and five European universities, NC Space Grant participated in the successful development of a proposal to create an international MS degree program in Aerospace Engineering. Through this program, students from participating US and European universities would spend one semester of their MS program at another participating university overseas. Funded by the US Department of Education, the grant includes the University of Colorado at Boulder (lead), University of Colorado at Colorado Springs, Stanford University, and NC State. The five participating European universities, funded through the Joint European Education Ministry, include one each from Scotland, Germany, and Portugal and two from Italy. Graduate students at other NCSGC universities can participate through a cooperative arrangement with NC State. The exchange program began in 2000 with Carlo Del Rosario from Politecnico di Milano coming to NC State for six months. Caroline

Nilsson from NC State will spend the Fall semester at Politecnico di Milano. ♦

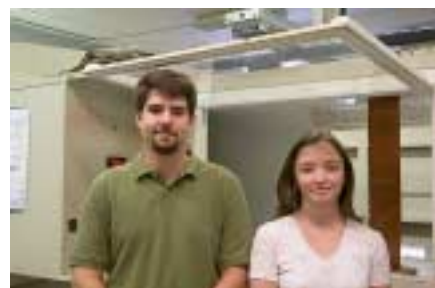
Dr. Wayne Christiansen, UNC-Chapel Hill Campus Director speaks on the Solar Project where he also serves as Director of the Morehead Observatory.



The UNC-Chapel Hill SOLAR Project. UNC-Chapel Hill, with seed grants from NC Space Grant Consortium, is holding workshops for inservice teachers to participate in their SOLAR. The first workshop was held in Summer, 1998, with a second funded and planned for Summer, 1999. The initial stage of the SOLAR Project targeted schools located in the Northeast coastal area of NC, which is the poorest, most rural and heavily minority populated part of the state. **Solar imaging project.** Four students at UNC-Chapel Hill have developed a series of solar images using special filters on the Morehead Observatory telescope. They also designed, tested and installed new optics for the solar cameras. The cameras have been used to produce an extensive database of solar images. ♦

Students participate in Summer Internships and Scholarships with Industrial Affiliates.

As an affiliate member of the NC Space Grant Consortium, the Space Grant Consortium will provide resumes of prospective students who are interested in summer internships. This includes students from any of the eight universities who are members of the Consortium. It also provides the opportunity for these interns to compete for scholarships and fellowships awarded by the consortium. The NC Space Grant Consortium is anxious to assist industry in developing internships for students. CargoLifters Inc. and Lockheed Martin are participates in the summer program and sponsored Joseph Norris and Jennifer Price at NC State in 1999 and 2000. ♦



Joseph Norris and Jennifer Price were awarded industrial scholarships.

MISSION - To promote and develop aeronautics and space-related science, engineering and technology programs by forming partnerships with all levels of educational institutions, industry, and government.

Student Profile: Rachel King

Year 1: Rachel King has developed experiments using Shape Memory Alloys (SMA) acting as actuators for the control of aerodynamic flows. SMAs are a group of metallic materials that undergo large controllable deformations in response to temperature changes and recover their previously defined size when subjected to the appropriate thermal loading. In a first experiment, she successfully demonstrated the feasibility of using SMA wire as actuators for a control surface on the wing of a Remotely Piloted Vehicle (RPV). She extended this method by designing an actuation system for an active boundary layer trip, which is the focus of her Masters' thesis work.



Rachel King demonstrates the SMA experiment at the 1999 Annual NC Space Grant Consortium Space Day Symposium.

An active trip on the low Reynolds number airfoil of an RPV can significantly enhance the RPV's range of operating conditions. This is accomplished by reducing the bubble drag created by the formation of laminar separation bubbles, characteristic of low Reynolds number airfoils. **Year 2:** Rachel plans to complete her experimental work this fall. Hot-film sensors and hot-wire anemometry will be used to determine the effectiveness of the active boundary layer trip in a series of wind tunnel tests. Rachel plans to complete her MS work next spring. (*Editorial Comment: Rachel King made a presentation on her work with Dr. Ndaona Chokani at the 1999 Space Day Symposium.*) ♦

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NC Space Grant Consortium

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