

**Consortium:** NASA Rhode Island Space Grant (RISG)

**Lead Institution:** Brown University

**Director:** Dr. Peter H. Schultz

**Telephone Number:** 401-863-2889

**Consortium Website URL:**

[http://www.planetary.brown.edu/RI\\_Space\\_Grant/](http://www.planetary.brown.edu/RI_Space_Grant/)

**Affiliate Members:**

Bryant College (Smithfield, RI)

Community College of Rhode Island (Lincoln, RI)

Graduate School of Oceanography (URI, Narragansett Bay, RI)

Providence College (Providence, RI)

Rhode Island College (Providence, RI)

Rhode Island School of Design (Providence, RI)

Natural History Museum and Cormack Planetarium (Providence, RI)

Roger Williams University (Bristol, RI)

Salve Regina University (Newport, RI)

University of Rhode Island (Kingston, RI)

Wheaton College (Norton, MA)

**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 Rhode Island Space Grant Consortium is a Program Grant Consortium funded at a level of \$410,000 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.

- RISG provides Fellowships for graduate students to develop or pursue NASA-related research through the university or NASA Centers. Our program targets students of young faculty members who are building research NASA-related programs.
- Exposes undergraduate and graduate students opportunities at all undergraduate institutions by providing support to attend NASA-related professional conferences (Lunar and Planetary Science Conference, LPSC) or visits to NASA Centers (NASA-KSC, NASA JSC).
- Encourages programs that expose faculty and students to NASA Centers (e.g., NASA-JSC, NASA-MFC, NASA-KSC, NASA ARC), thereby developing potential connections for future research.
- Provides gap-funding support for graduate students caught by sudden funding shifts in NASA budgets. This allows graduate students to continue pursuing their graduate studies while providing helping to sustain active research programs or develop new directions for their advisor.
- Supports collaborative programs between NASA Centers and university programs. RISG supports and enables such collaborations through courses linked to NASA center-research or NASA research themes.
- Develops and supports NASA-themed exhibits at local museums in order to enhance public awareness of space and aerospace research. These exhibits are then used to present STEM-based educator workshops using both NASA educational materials and expertise and new exhibit-relevant exercises.

### **Program Benefits to the State:**

- Provides hands-on NASA-related STEM experiences for students (K-12 through graduate), thereby enabling and sustaining a technical workforce.
- Introduces intern and employment opportunities for RI students with NASA or NASA contractors.
- Disseminates information about current NASA activities and opportunity to RI educators and students, and faculty.
- Develops innovative programs (e.g., exhibits, and events) in order to broaden awareness of NASA research and participation by faculty and students within RI.
- Awards competitive fellowships and scholarships to undergraduate and graduate students within the RISG Consortium.
- Stimulates new research directions and opportunities through seed research funds to faculty and post-doctoral researchers.

- Supports undergraduate programs (e.g., Undergraduate Low Gravity Flight Opportunity) at institutions in RI that connect students with NASA Centers or NASA-related research.
- Leverages Space Grant funds for new dollars for innovative NASA-themed programs, whether through foundations or industry.
- Engages the Rhode Island public through face-to-face contact with faculty and students involved in NASA-related research.

### **Program Goals:**

- Encourage undergraduate students to explore NASA-related science as a career.
- Enable graduate students to pursue research in NASA-related science and engineering.
- Broaden the interest in space exploration among the general public of Rhode Island.
- Enhance scientific literacy among students and parents in Rhode Island through NASA-related research and exploration.
- Engage math and science teachers in curriculum-enhancing programs.
- Provide mini-grants for new and innovative research programs.

### **Program Accomplishments:**

- Our Space Grant contributed to the STEM workforce in a variety of ways. We exceeded our 2007 goals by awarding 6 Graduate Fellows (5 for AY 2007/2008) and 4 undergraduate scholars (2 for AY 2007/2008). Additionally, we supported 3 graduate Summer Fellowships (1 for Summer 2006) and 5 undergraduate Summer Scholarships (3 for Summer 2006). Our Fellows focused directly on NASA strategic goals with themes.
- **Engineering Capstone Class:** Last year, a student-led project designed to a mission that will send a probe into the Moon at 10 km/s (*FLASH*). RISG awarded travel support for the FLASH Team (Brown's Engineering Capstone Class) to meet with researchers and engineers at NASA Marshall Space Flight Center. This not only exposed students to NASA Marshall but also stimulated new ideas at NASA for possible new mission designs.
- **Gap Funding Support:** a faculty member with a highly productive program was caught in the sudden cut backs in exobiology. As a result, he did not have funding to attend a Conference where he could present his research, talk with the NASA Program Manager directly, and prepare for the next call for proposals.

- **NASA-RISD Studio Design Course (Design for Extreme Environments):** The Rhode Island School of Design (RISD) developed a studio course working directly with personnel at *NASA's Johnson Space Center*, along with the recently formed Lunar Surface Systems Project office, to conceptualize designs for a pressurized rover-based lunar outpost. This effort has led to students being hired by NASA contractors after graduation.
- **Illustration Course (Human Factors):** Faculty at RISD also developed a course around the production of a new *NASA Human Factors* book. Personnel from *NASA Johnson* approached RISD for assistance to completely redesign this reference with specific focus on visual depictions of the human body. RISD engaged students and faculty from both its Illustration and Graphics departments. The scope of the course generated concepts and preliminary sketches for a redesign of this reference guide. The project focused on the end user of the guidebook, the ease of access of information and the ease of understanding and using the data.
- **Freshman Geology Seminar:** A new fall class was designed to engage incoming freshman in a hot-topic and NASA-relevant theme, in this case "Chicken Little or Armageddon: Past and Future Cosmic Threats." This freshman seminar was designed to introduce incoming freshman to a low-enrollment (18 students), seminar-style course. It began with reviewing two popular movies: *Armageddon* and *Deep Impact*. The course theme addressed the threat of earth-crossing asteroids and comets and introduced students to NASA programs. These themes included: search for Near-Earth Objects; research on terrestrial impact craters; results from NASA's Deep Impact mission; research on NASA Marshal's involvement in lunar impact flash and impact hazards on the Moon; NASA's involvement with ESA's Mars Express; approved NASA Discovery missions (NExT and DIXI) to comets; and the witnessed Peruvian impact in September 2007.
- **NASA-Themed Exhibit, "Get Extreme!":** Through collaborations with the *Northeast Planetary Data Center*, the *National Astrobiology Institutes* (at the *Graduate School of Oceanography* and *NASA Ames Research Center*), an exhibit on life in extreme environments was created. This was the second RISG-enabled exhibit that helped to establish a rotating NASA-themed room at the Museum. The exhibit enhanced the public's understanding and appreciation of astrobiology, the study of the origin, evolution, distribution, and future of life on Earth and in the Universe. Images and captions for the exhibit came from the *Northeast Planetary Data Center* (funded through NASA's *Planetary Geology and Geophysics*) and *NASA Ames Research Center* (Lynn Rothschild).
- **NASA-Themed Exhibit, "New Perspective on Mars: Mars 3D:"** This exhibit at the Natural History Museum was made possible through a close partnership between the museum, RISG, and the system of *Regional*

*Planetary Image Facilities* (the *Northeast Planetary Data Center* and the *DLR Planetary Data Center*). The exhibit featured 12 large panels (~9 feet by 12 feet) showing images of Mars in stereo taken by the European Space Agency's (ESA) *Mars Express* Mission. Although created for *Mars Express*, the RISG partnership used the exhibit to focus attention on NASA's missions and research about Mars. It was also used to make new connections within the state through a RISG-sponsored the VIP Opening including the Governor and other important leaders in business, Department of Education, and a State Representative. The PI for the HRSC (High-Resolution-Stereo Camera) instrument introduced the exhibit, along with the Mars Express Education Specialist. In attendance were two US Co-Investigators on the *Mars Express* Team from Brown University. Weekend docents (graduate and undergraduate students) from Brown University showed how their research using NASA missions (*CRISM*, *MOLA*, *MOC*, *Dawn*, *Deep Impact*) related to features on Mars. Classes from all grade levels (from primary to post-graduate) attended the exhibit, including introductory classes from all the local colleges and universities. Classes from *Brown University* included a Freshman Seminar about impact hazards (illustrated by the craters on Mars) and the introductory planetary class on Planetary Geology. Faculty from *Community College of RI* (RISG Affiliate) used the exhibit to develop classroom exercises. During the Mars exhibit, attendance was up 35%. Visitors expressed great interest in upcoming space and Earth science exhibits.

### **Student Accomplishments:**

Rhode Island has three institutions of Higher Education with advanced degrees in the area of NASA-related research (Brown, URI, URI/GSO). We stated that a measure of our success would be if we could increase the number of Fellows and Scholars to at least 5 in the coming year. In fact, we supported 9 RISG Fellows (including Summer Fellows) over the report period. We also supported two students to explore teaching as a career element for their future through Brown's pre-college summer course programs for middle school and high school students. We also awarded two Academic Year Scholars and eight Summer Research Scholars (Brown University, Bryant University, and Providence College). Finally, we supported internships at NASA Centers through a very active design program at the Rhode Island School of Design. In total (including internships and travel awards), we supported 76 students (57% female, 43% male) and 26% of the awards going to under-represented minority students (compared to a 17% minority enrollment in RI). There were 50 undergraduate awards, 3 Masters level, and 23 PhD awards. Students have gone on to graduate school, received their PhD's, or entered STEM entered the workforce.

- RISG exposes undergraduate and graduate students opportunities at all undergraduate institutions by providing support to attend NASA-related professional conferences (Lunar and Planetary Science Conference, LPSC) or visits to NASA Centers (NASA-KSC, NASA JSC). This year RISG supported a female chemistry student to attend the LPSC and discovered that her research was not only relevant but also respected by researchers attending her poster. This experience was a turning point for her career goals; she now is pursuing graduate studies in astrobiology and biogeochemistry.
- **Intern Programs:** RISG supported 11 interns from the *Rhode Island School of Design* as part of team-design projects during winter and summer sessions. The goal of this program is to offer RISD students the opportunity to learn from direct NASA collaboration. Some of these students have gone on to work as NASA contractors at the NASA centers as an outgrowth of their experience.
  - **Winter Session '07 at NASA-KSC:** RISG supported a RISD student to work at *NASA Kennedy Space Center* doing exhibit and graphic design under the direction of NASA Program Design Specialist, the exhibit designer at KSC. Projects that she worked on over the summer include sketches and designs for NASA's 50th logo, invitation designs for the upcoming shuttle launches, and redesigned the KSC Escort Manual.
  - **Winter Session '07 at NASA-JSC:** Four students were involved during a winter-session team project focusing on the *Lander Ascent Stage*. The team incorporated feedback from the studio final review, refined existing ideas, developed additional concepts addressing unresolved issues, and presented the work at the conclusion of Winter Session for review at *NASA's Johnson Space Center (JSC)* and at RISD during the spring semester. While in Houston, the work included ideation drawings, full-scale low fidelity foam-core mockups and a more durable evaluation and testing mockup for final astronaut review in a NASA simulator.
  - **RISD Summer Session 2007 at NASA-JSC:** NASA proposed a "suitlock" type airlock for use on the moon and in other space environments, as well. The suitlock concept is based on a rear-entry, partly hard-shell spacesuit (based on the NASA Mark III spacesuit design), in which the astronauts don and doff the suit by climbing into it through the "backpack" area rather than using a suit composed of "pants" and "top" joined at the waist, as in Apollo and shuttle era suits. Although there are several concepts for how this suitlock could function, the RISD team worked within constraints that have

been developed for the newly proposed lander design, including maximum dimensions, volumes and habitat shell configurations.

- **RISD Winter Session '08:** Working with *NASA Johnson Space Center's Habitability Design Center*, the interns are developing and mocking up habitats and Lander concepts for lunar explorations. They have been assisting in several design activities: (a) design and construction of a low-fidelity mockup of a lunar rover pressure vessel; (b) construction of rover mockup Master Equipment List system/subsystem boxes out of foam core; and (c) development of architectural layouts of lunar habitat concept interiors in support of Constellation Architecture Team work.