Rhode Island Space Grant Consortium

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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 **Rhode Island Space Grant** Consortium is a Program Consortium funded at the base level of **$430,000** for fiscal year 2011.

PROGRAM GOALS

The goals and objectives for Rhode Island Space Grant Consortium (RISG) are summarized below. These summaries are abridged for brevity, but *full descriptions of our goals can be found in our 2010 Budget Package*.

A. OUTCOME 1: *FELLOWSHIP/SCHOLARSHIP, HIGHER EDUCATION, AND RESEARCH INFRASTRUCTURE PROGRAMS*

1. Faculty and Research Support: Our goal was to provide NASA competency-building education and research opportunities for faculty, researchers, and post-doctoral fellows. For the Lead Institution, we proposed to allocate (from NASA) a total of $2.1K for research support. For our Affiliates, we allocated $15.0K for Affiliate research support in FY'11, which represented about 9.2% of our Affiliate allocation, consistent with our consortium emphasis on higher education. We anticipated making 5 awards. The Research Review Committee will review proposals on the following criteria (in order): relevance to NASA, merit, potential for broadening Affiliate involvement (new institutions or faculty), and potential for new NASA collaborations. Included in these proposals are travel grants to conferences, NASA Centers, and Visiting Researchers. *Our success is measured by: research papers, conference presentations, and new proposed research grants.*

2. Student Support: Provide NASA competency-building education and research opportunities to develop qualified undergraduate and graduate students who are prepared for employment in STEM disciplines at NASA, industry, and higher education. Success was ***Measurable*** based on the quality of the applicant pool, research papers/abstracts, presentations at the annual Symposium, and a short report (or published abstract/paper) at the end of the support period. All awards were ***Acceptable*** by tying directly to NASA's strategic goals and objectives. All awards were ***Realistic*** by their being matched. We proposed the following ***Specific*** awards over a one-year (***Time Frame***) in 2011: *Full-year RISG Fellowships* at Brown (2) and our Affiliates (2); *RISG Summer Teaching Fellows* (at least 2); *RISG Summer Research Scholars* (at least 2 at Brown; 6 at our Affiliates); *Academic Year Scholars* at Brown (1) and our Affiliates (6); *RISG Graduate/Undergraduate Travel Grants*; Joint Industry Partnership (up to 1); *RISD Internships at NASA Centers* (4).

3. Course Development: We proposed to develop 4 NASA-related course resources for integration into STEM disciplines.

a. **RISD Design Classes:** For the 2011-2012 academic year, the Department of Industrial Design proposed to focus on two classes the *Electrathon Competition* along with Habitat designs in the Extreme Environment coupled with internships awarded at the *JSC Habitability Design Center* (HDC).

b. **Brown Engineering Systems Design Course:** We proposed to support a class emphasizing hands-on learning through focused projects.

c. **Bryant University:** Funds allocated for two NASA-relevant curriculum development, supplies, and seminar speakers.

4. Travel Grants

a. **Student Field Experiences** (Lead)**:** We proposed to continue a popular undergraduate Spring Field Trip where undergraduates are immersed in field studies while using NASA materials (remote sensing and planetary analogs).

b. **Affiliate Travel:** We proposed support grants to NASA Centers across the consortium.

5. Targeted Institution Research and Academic Infrastructure: We proposed to host a program for a faculty member from a Tribal College, which is part of the Nebraska Space Grant Consortium. The program was designed to engage Native American faculty members in culturally relevant STEM-related fields using culturally relevant NASA themes.

B. OUTCOME 2: ***HIGHER ED PROGRAMS AND PRE-COLLEGE PROGRAMS***

1. Educator Professional Development:

a. **Museum of Natural History (MNH)**: 3 Educator workshops were planned at our Affiliate, the *Museum of Natural History*, all tied to 2 proposed RISG-co-sponsored exhibits.

b. **Teacher Partnership Program**: Our 75:25 (75% Research to 25% Outreach) Program engages our RISG Fellows and Scholars through partnerships with RI K-12 teachers. They bring their current NASA-focused research into the RI classrooms, thereby providing a context to classroom materials.

c. **Brown Summer Academy:** We proposed to support 3 classes for middle and high school students, 2 given by RISG Summer Fellows. This also enhances the teaching skills of the graduate students.

2. Curricular Support Resources: Our Affiliates (Museum of Natural History and the Ladd Observatory), Fellows, and Low-Gravity Program provide resources for students and mentoring through our outreach programs. We proposed to continue sharing research results and experiences with students through class visits, public speaking (e.g., local astronomy clubs), and special seminars.

3. Student Involvement K-12: Most of our involvement is through programs provided by our Affiliate, the Natural History Museum. In addition, our Fellows and Scholars interact with K-12 students through their participation. This experience, however, is primarily to provide teachers with STEM materials and to develop tools for informal-education skills that can be used as they become professional researchers.

a. **Gaudet Middle School Planetarium and Cormack Planetarium:** The *MNH* Director proposed to develop new STEM-based (and NASA-themed) programs for the Krupowicz

Planetaria (Gaudet Middle School) using resources provided by RISG-sponsored NASA programs.

b. ***NASA Mission-related Outreach*:** Fellows, Scholars, and faculty involved in NASA missions engage K-12 by describing their experiences and the need for academics in order to achieve their dreams of participating in the exploration of other worlds.

C. OUTCOME 3: ***GENERAL PUBLIC AND EXTERNAL RELATIONS PROGRAMS***

1. Resources:

a. **NASA-themed exhibits:** We proposed one new exhibit at the Museum of Natural History (but began planning for a second early in 2012).

b. **Ladd Observatory Outreach Program**: We proposed weekly views of current hot topics in astronomy along with hosting annual Public Open Houses.

2. Professional Development for Informal Education Providers:

a. Fellows and Scholars Teacher Partnerships: We proposed this program specifically to sustain involvement by past Fellows and Scholars in informal education, even after their fellowship ends, through small travel grants.

b. **Professional Development:** We proposed to support travel by informal education providers at the Museum of Natural History to NASA-related workshops and NASA-Center travel.

PROGRAM/PROJECT BENEFIT TO OUTCOME

A. *RISD* EXTREME ENVIRONMENTS: Class goals change each year through direct involvement with NASA-JSC personnel. In 2011, the class focused on deep-space habitat concepts (for an asteroid mission to L2). Selected students interned at NASA-JSC during Summer- and Winter Sessions assisting in the assembly of a full scale, high fidelity mockup for the next generation of a two-man pressurized surface exploration rover to be used in a simulator dome for visibility testing. In addition students focused on NASA's designs for the Space Exploration Vehicle focusing on the nose design, interior arrangement for driving displays, stowage and sleeping areas. They also worked on the Habitability Demonstration Unit developing concepts for galley, including food trays, workstations and eating/working surfaces.

B. INTERNATIONAL GENETICALLY ENGINEERED MACHINE (IGEM) COMPETITION: Through our Higher Education opportunity program, we supported **6** students in a multidisciplinary project requiring advanced knowledge of space science, human exploration and molecular biology, with the lab research that took place at Brown, Stanford and NASA Ames Research Center. This effort (*Mars BioTools: Synthetic Biology for Space Exploration*) involved undergraduates from both Brown University and Stanford University. The *iGEM* team placed in the top four teams of the Americas competition (with over 60 teams entered) and won the Award for the *Best Presentation*. At world championships (with again over 60 worldwide finalists), the team placed in the top 16 and won the Award for the *Best New Application*. This program was highlighted in various publications and NASA news (12/13/11).

C. NASA-THEMED EXHIBITS: Three NASA-themed exhibits at Providence's *Museum of Natural History* (MNH) were supported this year: "*Alien Worlds: New Discoveries Around Distant Stars*;" "*Space Weather: Living with a Sta*r;" and "*Saturn: Beyond the Rings."* The first two NASA-themed exhibits were developed in partnership with RISG and the Northeast Planetary Data Center, *NEPDC* (NASA's Planetary Geology and Geophysics, Science Mission Directorate). In addition, working with the *NEPDC* and the *National Lunar Science Institute* we made substantive contributions to a major exhibit ("From the Moon: Mapping & Exploration") at the College of Charleston. Such exhibits engage

students and faculty in their construction, educators through classroom visits and themed workshops, and the public. In addition, each exhibit generated considerable statewide press and recognition. The VIP opening of the *Space Weather* exhibit included the Mayor of Providence, who subsequently recognized the importance of this effort in various venues.

PROGRAM ACCOMPLISHMENTS:
OUTCOME 1 (ACHIEVEMENTS AND PROGRESS)

A. FELLOWSHIP/SCHOLARSHIPS: Each award was competed under the categories noted below (***Specific)*** and was directly related to NASA's mission and goals (***Acceptable***). Our primary metrics for our Fellows included the quality of the applicant pool, presentations at the annual symposium, and papers/abstracts (***Measurable***). Awards fell within the budget and were matched (***Realistic***). Different awards covered different award periods and require separate applications (***Time Frames***). All goals and objectives were achieved. We encouraged women and under-represented groups to apply. We supported 20 males and 5 females. Unfortunately, we had no underrepresented students this year (but did provide travel funds). Consequently, we did not meet our goal of 18% for awards to under-represented minority students (0%) and did not meet our goal of 40% for awards to women (20%). We have discussed this issue with Deans and Affiliate Representatives in order to increase awards in both categories next year. All awardees met our criteria for selection (grades, letters, project, and NASA relevance). We exceeded our goal due to the one-year extension of our prior 5-year award, which saved first-year funds for this report period, coupled with unexpected match opportunities.

1.Graduate Fellowships: A total of 14 graduate awards were made. Seven (7) Summer Fellows were awarded, matching our SMART objective. We also awarded 7 Academic Year (AY) fellowships (4 at Brown and 3 Affiliate URI). This exceeded our objective (2 at Brown; 2 at our Affiliates) due to available funds and match opportunities; the low number of Affiliate awards resulted from emphasis on Higher Education.

2. Undergraduate Scholarships and Internships: A total of 21 undergraduate awards were made. We made 2 *Academic Year* awards (1 at Brown and 1 to our Affiliates). We also awarded 8 Summer Scholars (5 Brown; 3Affiliates), thereby exceeding our goal of 5 due to matching opportunities. Summer internships included 10 at NASA Centers through joint classroom programs: 4 internships at NASA JSC (RISD/JSC Design class); and 6 students at NASA Ames (Brown/Stanford IGEM Program). Limited institutional matching precludes participating in NASA Center internships through SOLAR. As proposed, 1 student participated in a *Joint Industry Partnership* (UTC). All fellows/scholars published papers and/or presented their results at national meetings, NASA Centers, and our annual symposium. Selected topics included: origins of homochirality, chemical alteration on Mars, dwarf spheroidal galaxies, light curves of minor planets, processing electrodes in dye-sensitized solar cells, weak-lensing studies of galaxies, high-redshift nests of galaxies, volcanic flooding of lunar landscapes, shock effects in sediment-covered substrates, new techniques for rapid delivery of medicines, preservation of organics t hrough deep time, environmental effects from the Manicouagan impact. Such studies enable STEM careers for the students and stimulate new NASA grants.

B. HIGHER EDUCATION (HE):

1. **Course Development:** We *exceeded our goal* by supporting 6 (rather than 4) new/revised NASA-related courses. Each class met our SMART objectives: clear goals (*Specific*); hands-on student involvement; reviewed (*Measureable*); links to NASA themes or competitions

with presentations at our annual Symposium (*Acceptable*); clear objectives and matched funds (*Realistic*); and awarded for one year (*Time Frame*).

a. RISD Design for Extreme Environments program (3): Two revised and one new course were offered: (1) *Electrathon Competition* (a new competition for efficient electric-car designs); (2) "*Design for eXtreme Environments*"; and (3) "*Design to Compete*" (a course around developing the RISD Moon Buggy). The latter two involved trips to NASA Centers.

b. Brown Engineering Course (1): This Engineering course (*ENG1760*) emphasizes a systems approach but is structured around three to four themes. This year the course included NASA-relevant themes by developing a *CubeSat* (called *EquiSat*) producing light flashes visible from Earth along with tracking using an amateur radio. *EquiSat* was created from scratch and cost only $3K to build, in contrast with other *CubeSat* programs costing 10x more. This strategy stimulated innovative solutions.

c. Bryant University Initiative (1): As part of a new grant to enhance and complement their new graduate and undergraduate programs in Environmental Science, *Bryant* offered a new RISG-supported course (*SCI 462*) "Plant Diversity in Ancient and Modern Environments." A second planned class was not offered since it did not meet the necessary enrollment. In support of these courses, an expert in astrobiology was invited to give a general presentation at Bryant.

d. Brown University IGEM (1): An independent study course (*BI1980/1960*) was developed for students in order to continue hands-on participation in a bioengineering competition (IGEM) effort following their summer program at NASA Ames.

2. **RISG Graduate/Undergraduate Travel Grants:** We achieved our goal to enhance student professional development through matched awards to 11 students over the report period. Targets vary each year due to match requirement. Students benefitted from integration into NASA Center programs and/or NASA-related conferences/workshops. Each award required written justification, NASA relevance, and evidence of active participation (presentations, posters, reports).

3. **Student Field Experiences:** We exceeded our goal by supporting two (5 instead of 2) hands-on learning trips (2 by the Lead Institution, 3 by Affiliates). Brown students (26) traveled to *Death Valley* over spring break with applications to Mars, a trip leveraged by multiple sources (foundation, department, sales). Co-sponsored class 3 trips from to NASA Centers included: 12 *Bryant* students to *NASA Stennis*; 13 RISD students to *NASA-JSC* (4) and *NASA-MSC* (9); and 6 students from Brown (*NASA Ames*). Success was measured by relevance, direct contact with NASA personnel, oral/poster presentations and written student responses. We supported 55 students from 5 institutions (*exceeding our goal of 20*). All trips supported classroom activities, hands-on competitions, and/or HE enrichment.

4. Minority-Serving Institutions: We initially planned to develop a college-transition program for Native Americans. We did not meet this goal. Instead, we initiated new plans with the *Leadership Alliance* at Brown University and the *Tougaloo/Brown College Partnership* in order to leverage sustainable programs with established targeted institutions. Another project (terrain modeling) resulted in a new working relation with the *Perkins School for the Blind* (Watertown, MA).

C. RESEARCH INFRASTRUCTURE:

1. **Affiliate Faculty and Research Support:** Our goal each year is to enhance and deepen NASA-related research through small seed grants limited to <$10K per investigator for 5 grants. We met

our goal by supporting 5 researchers at 3 institutions. *RISD*: seed funding for a radically different flexible glove design for astronauts. *Roger Williams University* (RWU): new microwave methods for processing electrodes in dye-sensitized solar cells, resulting in a patent application. *Bryant University*: a new Department of Science and Technology (2009) coincided with our first substantive award. In 2011, Bryant established a new Masters program and hired a young investigator in Astrobiology and played a major role through fully matched seed funds for 3 faculty members focusing on environmental change: modeling of climatic systems (climate forcing at high latitudes); climate change during Neolithic time and for the origin of human agriculture; environmental change and social impact (earth-system response to natural/human-induced change); arctic role in long-term global climate change; molecular preservation of Cenozoic fossils; bio-molecular transformation in organisms over deep time.

2. Lead Institution Faculty and Research Support: We exceeded our goal ($2.1K) by supporting 2 seed grants. A post-doctoral researcher (Geology) to participated in a mission team meeting (no other funds available), as well as research travel to NASA Ames (resulting in a patent application, published paper, and NASA proposal submission). A second effort (Cognitive Sciences) developed a computational model for control of a biomimetic system for orientation in a turbulent fluid medium that resulted in 2 new publications and contributing to two honors theses.

OUTCOME 2 (ACHIEVEMENTS AND PROGRESS):

1. **Educator Professional Development:** We significantly exceeded our goal (4) by supporting a total of 25 NASA-related educator workshops were held over the report period (approximately 200 participants) through the *Museum of Natural History* (MNH). Of these 18 workshops, 3 specifically focused on content and educational programming for the RISG-supported exhibits (Exploring the Earth-Sun system, our own solar system, and the universe beyond). Rick Varner, Aerospace Education Specialist at NASA/OSU, facilitated 3 STEM-based Sun-Earth relationship workshops for educators. The Museum's Director facilitated a series (4) of STEM-based learning experiences, utilizing NASA resources, for afterschool providers for the state of RI, RIASPA. In addition, the Director participated in NASA's Lunar Reconnaissance Orbiter (LRO) Educator Lunar Workshop, June 2011 (University of New Hampshire, Durham) involving about 40 educators from around New England. The Museum also facilitates STEM workshops for formal and informal educators from Afterschool Programs, Providence After School Alliance, and home-school families. RISG supports these efforts through materials, content, and exhibit support (Outcome 3 below). In addition, *the Krupowicz Planetarium* supported 7 workshops engaging 25 teachers: *Earth, Space and Life Sciences*, *Life of Stars*, *Climate Change*, *Planetary Geology*, *Sun-Earth Relationship*, *Earth-Moon Relationship*, and *Space Weather*.

2. **Pre-College Summer Courses:** We supported a class through Brown's Office of Continuing Education for middle and high school students. The classes were: "Astrobiology: the Search for Life in the Universe" taught by Seth Horowitz. We did not meet our goal of 3 classes due to low enrollment.Course descriptions have been changed in order to attract more students.

3. Student Involvement K-12: We met our goals through programs at the Museum of Natural History. Advanced STEM programming at the MNH aligned with state Science Grade-Span Expectations (GSEs). Over the last year the *MNH* attracted over 33,000 visitors, 6,140 school children, 473 children in camp/after-school programs, and 123 girls in Girl Scout programs.

a. *Krupowicz Planetarium* (*Gaudet Middle School*) *Partnership*: Through a MNH partnership, the *Krupowicz* Planetarium is a hands-on teaching and enhancement tool for middle school teachers and students about 1500 students.

b. *NASA Mission-related Outreach*: As part of our Scholars Program, RISG funded an intern to work at the museum during the 2011 summer. He aided in facilitating workshops for K-12 students.

c. *Antarctica Blog*: One of our Fellows had the opportunity to do research in Antarctica about weathering rates and conditions as an analog for Mars. She generated a weakly blog for K12 students in RI.

4. 3D MakerBot Project: In conjunction with the *Northeast Planetary Data Center* (*NEPDC*) at Brown, digital terrain models of asteroids and planetary surfaces were developed in order to enhance student comprehension and educational outreach to the visually impaired (*Perkins School of the Blind* in Watertown, MA). This was displayed at the annual symposium and *NEPDC* Open House. It was also featured in online articles. About 120 students have participated to date in this pilot program.

5. **Summer of Innovation:** Our Affiliate (MNH) leveraged our Space Grant activities to receive funding from the Summer of Innovation program for teacher training and summer camp for middle-school.

OUTCOME 3 (**ACHIEVEMENTS AND PROGRESS):**

A. RESOURCES: We continue to leverage our program with the *Museum of Natural History* (*MNH*, Providence) in order to maximize our reach throughout RI.

1. Exhibits: We supported 3 new exhibits, thereby exceeded our goal (1 exhibit). (a) *Alien Worlds: New Discoveries Around Distant Stars* (February 2011 through January 2012). After the success of a previous exhibit on the birth of stars, the same Brown faculty member worked with the Museum to develop another exhibit. This focused on the science that is emerging from the discovery of exo-planets. (b) "*Saturn: Beyond the Rings"* (opened October 2011): The MNH and RISG Directors partnered with *Cornell University* and the *Northeast Planetary Data Center* to bring an exhibit from Cassini-Huygens Mission to the museum. Objects also complemented the awe-inspiring exhibit including a scale-model of the spacecraft (22 feet high x 13 feet wide) as well as objects from the Museum's collections, Brown (Ladd Observatory, Geosciences), and items from personal collections. Although small in cost ($3K), this exhibit had a big impact. (c) "*Space Weather: Living with a Star*" (January 2012 opened): This new exhibit resulted from a partnership with *NASA Goddard* highlighting NASA missions about the role of our star on our environment, establish awareness of increased solar activity, and make more relevant coming events (e.g., the transit of Venus). The concept originated from a professional development travel grant by the MNH Director to NASA Goddard. General museum attendance over last year is up by 17%; the planetarium attendance is up 22%.

2. Engagement in RI Educational Programs: In order to implement systemic change within the RI education, both the MNH Director (Renée Gamba) and MNH Educator (Dawn Temple) continue as *NASA Solar System Ambassadors*. The Director also serves on a number of panels and committees: *Providence After School Alliance STEM Advisory Team*; *Providence After School Alliance Experiential Learning Advisory Committee*; and *Middletown School Strategic Planning*. Her engagement in statewide committees contributes to the integration of these NASA-theme exhibits into the classroom in meaningful and sustainable ways (including *Summer of Innovation*).

3. Ladd Observatory Outreach Program: RISG supports an annual (and popular) Open House during Halloween that attracts more than 320 visitors. This support broadens participation through advertising and displays. This also reinforced the community awareness of the observatory through hands-on learning emphasizing "seeing it for yourself."

4. NASA Mission-related Outreach: Four presentations were made directly related to NASA missions: Two talks at the "International Observe the Moon Night" October 8th; Invited Banquet Talk for *Astro-Assembly* (North Scituate, RI); and LRO presentation at the College of Charleston, SC. Graduate students involved in mission research made presentations to local astronomy clubs, elementary schools, and visitors. The Director was involved in a press conference at about the *Stardust-NExT Encounter* (NASA Headquarters) and participated in two television productions. Exhibits at the MNH highlighted NASA missions: *Cassini-Huygens*, *Kepler*, *SOHO*, *SDO*, *STEREO*, and *DIXI*. In addition, the RISG Director presented a Keynote presentation (about the science from NASA's DIXI and Stardust-NExT missions) to the entire elementary school class (~385 students) for underserved students in Providence (*Vartan Gregorian School*) in June 2011.

5. Krupowicz Planetarium: This partner (with MNH) holds 5 family fun nights each year with NASA-themed activities.

B. PROFESSIONAL DEVELOPMENT FOR INFORMAL EDUCATION PROVIDERS

1. Summer Teaching Fellows: We proposed to fund *RISG Teaching Fellowships* as a response to student requests for hands-on teaching experience. This award was made to two graduate students with faculty mentors, developing a one-week NASA-themed class over the summer, for middle school students. Only one class was offered due to low enrollment. New descriptions and titles will ensure this experience for our students this coming summer. Nevertheless, we supported a Summer Undergraduate Intern at the MNH in order to develop and expand NASA content for presentations and planetarium shows.

2. Travel Grants: ***RISG*** **supported the Museum of Natural History Director attending professional development workshops that were integrated into new programming at the Cormack and Krupowicz Planetaria; exhibits; and programming; and professional development for teachers and informal educators at the Museum of Natural History and Krupowicz Planetarium. Workshop themes included Climate Change (JPL/NASA, Pasadena California), Heliophysics and Astrophysics (NASA Goddard Spaceflight Center, attended with Curator of Education), Astronomy and Astrophysics at Kitt Peak and Mt Lemmon Observatories. Additionally, the Director participated in NASA's Calendar in the Sky Workshop, in Phoenix, AZ.**

PROGRAM CONTRIBUTIONS TO PART MEASURES (HE = Higher Education; K12 = Elementary/Secondary School)

Student participants employed by NASA, aerospace contractors, universities, & other educational institutions (target = 65%): In 2011, we exceeded our target at **89%** for our awardees. See above for details.

Percentage of undergraduate students moving on to advanced education in NASA-related disciplines (target = 45%): We exceeded our target at **86%** for our awardees.

Diversity: Number of Underrepresented and Underserved Students in Higher Education (target = 20): We did not meet this goal due to unexpected shifts in management. This will change in the coming year.

Number of institutions served in designated EPSCoR States: Target = 0 (had not participated in EPSCoR). Now **2**.

NASA-related STEM Course Development (target = 4): **6** new/revised NASA-related courses.

Educators using NASA Content (Our Target (25%) represents 2829 educators (just Space Grant): We have reached 289 educators who are using NASA content, based on materials handed out and feedback (10% of educators in RI).

Educator Participation (target = 32% = 3620 educators)**:** educator workshop participation = **275**

Student expression of interest in STEM careers (target =12% of the RI students = 17,500 students)**:** 1380 students.

NASA Education Priorities:

1. Support the Administration's STEM education teaching and learning improvement education efforts: Through our Affiliate (Museum of Natural History and associated planetariums) we supported the following: curricula content through educator workshops directly related to NASA themes; support of *NASA Solar System Ambassadors*; Summer of Innovation sub-award; after-school programs on NASA research/themes; participation in city/state panels and committees in order to integrate NASA themes and STEM into the classroom; innovative, hands-on NASA-related exhibits that engage under-served populations, which the museum serves.

2. Engage the Nation's universities, colleges, students and faculty: We achieve this goal through: fellowship, scholarships, internship opportunities, curricular development, and research seed grants directly related to NASA goals and objectives. We offer hands-on summer research activities at NASA Centers through: classrooms in NASA (*JSC*'s Habitability Design Center; *IGEM* program at NASA *Ames*, Moon Buggy Competition at *MSFC*); *CubeSat* programs; internships (as allowed by the availability of matching non-federal funds); community college opportunity announcements from Space Grant or NASA Education programs; participation in NASA missions (e.g., Mars-*CRISM*, *LRO*, *Hubble*, *LCROSS*, *DIXI*, *Stardust-NExT*, and *BLAST* at *Brown*); involvement in global climate change research (*Bryant*); development of next-generation batteries (*URI* and *Brown*) and solar cells (*Roger Williams*).

3. Inspire and engage the Nation's K-12 students and educators: Provided museum internships for graduate students in order to provide content for our innovative professional development partners (MNH); developed hands-on museum NASA-themed exhibits through university and NASA partnerships that were used to inspire K12 students; supported educator workshops in order to introduce NASA content into the K12 classroom; engaged K12 students and educators through graduate and undergraduate programs to present NASA research; prepared precollege students through NASA-themed summer classes;

IMPROVEMENTS MADE IN THE PAST YEAR:

A. MANAGEMENT CHANGES: In July 2011, our Program Manager (PM) accepted another position within the University. We were able to hire a new PM in September. The transition in management was made much smoother by the assistance of our previous PM (including participation in selection of her replacement, assisting the new PM in reporting, dealing with reporting and university procedures, and advice). Nevertheless, we had to scale back our Teacher Partnership Program, especially with the addition of EPSCoR. Our Affiliate Representative at the University of Rhode Island also changed due to competing obligations (department chair).

B. RESOURCE ALLOCATION ADJUSTMENTS: Two changes in allocations were made in 2011. ***First***, we provided nominal support (<0.1FTE) for a post-doctoral Associate in order to develop new ties with NASA Ames, participate in mission opportunities, apply for a patent (outgrowth from Space Grant support), and connect with Hawaii's SG launch capability. ***Second***, We originally proposed to initiate a program for Native Americans but this proved much more difficult. Consequently, we are re-directing our efforts to partner with nearby institutions (e.g., *Perkins School for the Blind*) and established programs (*Leadership Alliance* and the

Tougaloo/Brown College Partnership). Our redirection will emphasize partnering of faculty and student in mutually agreed research projects. In the coming year, we also will explore parallel programs at our Affiliates.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION: *List the institutions that comprise the consortium; include the name, type of institution, and key characteristics.*

Brown University: Lead institution. This is a private university with a variety of undergraduate and graduate degree programs. Given that the grant is based here it is fairly involved with the grant and providing support.

Bryant University: Private university. Their relatively new programs in Environmental Sciences and Biology have begun to flourish and receive strong institutional support especially as they are learning how RISG can benefit them.

Community College of Rhode Island: Community college. This two-year community college provides opportunities for re-training and a stepping-stone to a four-year institution (including Brown).

Graduate School of Oceanography: *GSO* is part of the state-supported *University of Rhode Island* system (Narragansett Bay campus) exclusively for graduate studies and research on oceanography. They are the *Sea Grant* Lead for the state. Their NASA research includes remote sensing, astrobiology (past *National Astrobiology Institute* Lead), and climate.

Providence College: Four-year liberal arts institution. This past year their Affiliate Representative has received some seed funding from RISG and has started to gain an enhanced understanding of the program.

Rhode Island College: Primary training institution for teachers in the state. It houses the NASA's *Educator Resource Center*.

Rhode Island School of Design: *RISD* is a nationally ranked private college in the arts and design. *RISD* has been a very active of the consortium through innovative curricula linking industrial design classes with NASA centers (JSC, KSC).

Museum of Natural History: *MNH* is funded by the *City of Providence* and is located in historic Roger Williams Park. It contains the *Cormack Planetarium* where NASA-related programming is often featured. This museum features rotating NASA-themed exhibits and programs and offers supporting educator workshops and K12 programs.

Roger Williams University: *RWU* is a private institution (MAT, Masters of Public Administration, Architecture, Law, Criminal Justice) with growing programs in environmental and international studies

Salve Regina University: University offering PhD in the humanities. They offer a number of programs in the STEM fields.

University of Rhode Island: Lead state-supported undergraduate/graduate institution (identified here as "*URI*") and a *Land Grant* institution. *RISG* supports students and faculty in engineering and geology. They will host the RISG Symposium.

Wheaton College: Private liberal arts college with several faculty members who are involved in NASA-related research (studies into the satellites of the outer planets (using Galileo and Cassini data), astronomy, and environmental science.

Other Partners: In addition to our formal Affiliates, *RISG* has active partners including the:

Northeast Planetary Data Center (*NEPDC* at *Brown*) is funded through NASA's Planetary Geology and Geophysics Program and is an active partner through cooperative programs (exhibits) and access to planetary image data.

Ladd Observatory: Ladd provides weekly notices on topics related to astronomy as well as lectures and special events.

Krupowicz Planetarium: This planetarium is located at one of the schools within the Middletown Public School System and provides an outlet for increased outreach.