

New Jersey Space Grant Consortium  
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Lines of Business (LOBs): NASA Internships, Fellowships, and Scholarships;  
Stem Engagement; Institutional Engagement; Educator Professional Development

A. 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 New Jersey Space Grant Consortium is a Program Grant Consortium funded at a level of \$570,000 for fiscal year 2016.

B. PROGRAM GOALS

Goal 1: To develop a scholarship and fellowship program that provides graduate as well as undergraduate research and educational opportunities to a diverse spectrum of New Jersey students in the disciplines of science, math, technology, and engineering, with emphasis on aerospace, and with research opportunities at NASA centers.

- Objective 1.1: \$145,000 will be awarded in fellowships to N.J. students in STEM fields and in a way that reflects the diversity characteristics of N.J. college students.
- Objective 1.2: \$28,000 will be awarded through research fellowships to graduate students, through the NASA/NJSGC Graduate Student Fellowship program.
- Objective 1.3: \$57,000 will be awarded as Summer Fellowships to undergraduates in N.J. to conduct research at a NJSGC member university, at an approved industrial corporation, or at a NASA Center.
- Objective 1.4: \$60,000 will be awarded as Academic Year Fellowships to New Jersey undergraduate students in STEM.
- Objective 1.5: At least 90% of the summer fellowship students and graduate research fellows will present their research at the NJSGC fellowship conference.
- Objective 1.6: All of the fellowship recipients will be subject to longitudinal tracking. At least 80% of award recipients will respond to the longitudinal tracking survey.

- Objective 1.7: Based on national statistics on minority enrollment in N.J. colleges, at least 28% of all student awards and other direct support will be awarded to students from underrepresented minorities. At least 45% of award recipients will be females.

Goal 2: To promote research activities relevant to NASA and New Jersey industry, to build research networks and to create pipelines from research to industrial development, and support STEM workforce development. To support junior faculty and graduate students in research, to increase diversity among researchers and graduate students.

- Objective 2.1: \$0 will be awarded for Support of New Jersey Research Centers to collaborate with their activities in aerospace research and publication during FY2016. (A NJSGC program to be revived when budgets rise).
- Objective 2.2: \$4,000 will be provided for Travel Support to students to attend scientific conferences.
- Objective 2.3: The Research Clusters and Mini Grants program will provide \$50,000 to research clusters in N.J. universities or to junior faculty in STEM. A very popular program.
- Objective 2.4: \$7,000 will be allocated for Community College Research with the goal of supporting the students in some capacity through acceptance in a 4-year institution of higher learning.
- Objective 2.5: \$27,000 will be allocated for programs for Minority Student Development for Graduate Study (RiSE).

Goal 3: To produce diverse and well-educated college graduates in STEM who will be inspired by their NJSGC experience and will be motivated to pursue careers in STEM and aerospace, as well as graduate study, thus creating a pipeline to the STEM workforce. To nurture interdisciplinary approaches and to develop higher education networks.

- Objective 3.1: Allocate \$20,000 for support of Design Projects that will foster a higher education network in New Jersey and provide a hands-on experience to students.
- Objective 3.2: Allocate \$25,000 for an Industry Co-Op/Internship program for students to receive co-op or internship experience.
- Objective 3.3: \$5,000 will be allocated for the Aerospace Course Development program, for N.J. faculty to develop new college courses in aerospace and teach them.
- Objective 3.4: \$15,000 will be provided to New Jersey Universities for Summer Development programs for entering freshmen and for K-12 college bridge programs.
- Objective 3.5: \$9,000 will be allocated to support the NASA GISS Summer Internship Programs at the Goddard Institute for Space Studies in NYC, formerly the NYCRI program. NJSGC will match funds for student support from “The Opportunity Network”.
- Objective 3.6: \$34,000 will be allocated to New Jersey college students and faculty members to participate in the CubeSat, Rock-SAT-C, and Ballooning programs at Rowan University, Stevens Institute of Technology and Rutgers University, respectively. This year New Jersey Space Grant has been able to increase its funding of hands on programs with the increase NASA.
- Objective 3.7: \$15,000 will be allocated for the running of K-12 bridge programs, which connects K-12 students with college faculty and industrial experts for a summer of enrichment.

Goal 4: To inspire, motivate, and develop New Jersey's math and science teachers by means of teacher training, educational outreach, and professional development programs.

- Objective 4.1: Allocate \$25,000 to support science Teacher Training programs.
- Objective 4.2: At least 80% of teachers will respond to our survey. At least 75% of teachers will have used their training within a year and 90% within two years of receiving their training.

Goal 5: To stimulate a broad interest in, and an understanding of, various scientific and technical disciplines of interest to NASA by supporting informal education STEM programs. Promote awareness of NASA's mission and its contribution to society.

- Objective 5.1: \$6,435 will be allocated for support of planetariums, science centers and new programs.

Goal 6: NJSGC will be a proactive and diverse organization that is run efficiently and effectively. All activities will continuously be monitored and new initiatives pursued.

- Objective 6.1: NJSGC will have an effective, efficient and frugal office which continuously monitors itself, and whose documents are up to date. NJSGC will have well-defined operational policies and procedures for all of its activities.
- Objective 6.2: NJSGC will have a set of active affiliates who contribute to the programs of the consortium by serving on committees, publicizing NJSGC activities at their organizations, and by recruiting students and faculty to apply for NJSGC awards.

Goal 7: NJSGC will strive for diversity in all of its programs and will make its awards in a way that reflects the diversity of the state of New Jersey. NJSGC will inspire members of the minority community to choose careers in STEM and will work with minority serving institutions in New Jersey and as well as other states, supporting them with funding, fellowships and internships.

- Objective 7.1: Based on national statistics on minority enrollment in New Jersey colleges, at least 28% of all students receiving stipends will be underrepresented minorities. At least 45% of all student award recipients will be female students.
- Objective 7.2: NJSGC will actively engage and support minority serving institutions in New Jersey and in nearby states, including universities and community colleges with sizable minority populations.

#### C. PROGRAM/PROJECT BENEFITS TO PROGRAM AREAS

##### *Highlights and/or anecdotes:*

Fellowship: Niasia Williams, an Academic Year Fellow for the 2014-2015 and 2015-2016 academic years, has enrolled in a master's program at Rutgers. She continues to work with Prof. Kimberly Cook-Chennault and serves as the Technical Outreach and Community Help

Chair of the National Society of Black Engineers. She also facilitates programs at NSBE that encourage positive STEM engagement for underserved youth.

Higher Education: The Rutgers AIAA student group, which NJS GC supports, did well at the annual unmanned aerial vehicle competition. We are now working on developing UAV capabilities statewide and perhaps develop a statewide UAV event for college students.

Higher Education: For about three years, we have been supporting the development of an undergraduate curriculum in aerospace engineering at Rutgers University. We are happy to report that Rutgers now offers the B.S. degree in aerospace engineering. Haim Baruh taught the inaugural “Introduction to Aerospace Engineering” course in the Spring 2016 and Fall 2017 semesters. We continue support of the program with course development grants.

Higher Education: The twin NASA astronauts, Mark and Scott Kelly, were honored by their hometown of West Orange, N.J., where the township renamed the elementary school that the Kelly brothers attended as The Kelly School. NASA Associate Administrator for Education Dr. Don James attended the ceremony and so did the NJS GC leadership team.

Higher Education: NASA Deputy Associate Administrator for Education, Dr. Roosevelt Johnson, joined the NJS GC leadership when he gave a seminar at the Rutgers Graduate School symposium on career choices and diversity. NJS GC was a co-sponsor of that event.

Higher Education: Original Rock-On and Rock-SAT students, Ethan Hayon, Michael Giglia, and Andrew Isherwood have now secured jobs in industry at Natural Wireless, Cooper Union and Infinium Corporation while Katie McClung is pursuing her doctorate in Biomass Technology in Switzerland. NJS GC is continuing with the Rock-SAT-C program and will launch another payload with a project on mechanical vibrations led by Jesse Stevenson in June 2017.

Pre-College: Approximately 140 New Jersey teachers spent a week at Raritan Valley Community College (RVCC) in July and August 2016 to learn more about the Next Generation Science Standards (NGSS). Teachers engaged in exemplary science, astronomy, and engineering investigations that consisted of a series of student performance tasks. They reflected on their learning and used a nationally tested template to plan NGSSS-aligned science lessons.

#### D. PROGRAM ACCOMPLISHMENTS

NASA Internships, Fellowships, and Scholarships (NIFS):

- NJS GC runs three fellowship programs: Undergraduate Academic Year, Summer and NASA Internships, and Graduate. This year, we expect to support around 40 fellows, and to send three students to NASA centers.
- While fellowship programs do not require match, NJS GC requires graduate fellowships to match. Match makes the stipends more attractive.
- NJS GC holds two annual conferences. One meeting is held in spring, with the academic year fellows highlighting their work in a poster session. The poster session is preceded by the NJS GC annual affiliate meeting. The second meeting is in August, where the

summer fellows and research cluster participants make presentations. The poster session in Spring 2016 had the highest attendance in our history.

- NJSGC considers all fellowships it gives out as major awards and tracks the fellowship recipients.

Please note: The beginning of the grant date of NJSGC was changed from August to May in 2015. This means that the academic year and graduate fellowships are distributed over the academic year 2016-2017, the summer fellows and summer NASA interns are reported for the summer of 2017. We are gradually making the reporting shift for summer fellows and interns.

#### Higher Education Projects:

- The Design Project program provides support for project supplies for New Jersey college student projects. We also support student design groups who participate in national competitions. In FY2016, we supported an autonomous airplane project by the AIAA student section at Rutgers, as well as at Rowan. We are currently working on expanding that program statewide and pave the way for a local autonomous aircraft competition.
- The NJSGC Co-Op/Internship program integrates learning with hands-on development work in industry. During FY2016, NJSGC supported two students.
- The Course Development program supports development of new aerospace courses. The aerospace course development programs that we have supported over the last two years has led to the development of the B.S. degree in aerospace engineering at Rutgers University. We are currently supporting a space systems design course, which will be taught in the Fall 2017 semester at Rutgers.
- NJSGC initiated participation in the Rock-ON program in 2010 by sending Joseph S. Miles, NJSGC's Program Coordinator to the program. The following year, 2011, six Stevens students attended Rock-ON. In 2012 NJSGC began annual participation in the Rock-SAT-C. To expand NJSGC's hands on programs, a ballooning project was introduced this year at Rutgers University, and a CubeSat program was introduced at Rowan University. We currently are in discussions to develop a cube sat project with the Princeton Plasma Physics Laboratory.
- The Partners in Science program of the Liberty Science Center brings together high school students, for a summer of enrichment under the tutelage of an industry professional. We supported ten high school students in FY2016.

#### Research Infrastructure Projects:

- Research clusters in FY2016 are at Rowan, Seton Hall, Stevens, TCNJ, and Ramapo College/NJIT. 24 students are supported (at Rowan, Rutgers, Seton Hall, Stevens, TCNJ, and at Ramapo/NJIT). Due to increased NASA funding, we have expanded the research clusters program, a very popular program requiring matching funds.
- The Research in Science and Engineering (RiSE) program, run by the Graduate School of Rutgers University, recruits, trains and mentors underrepresented, disadvantaged and underserved students in STEM disciplines, and prepares them for graduate school and research. This year, NJSGC is supporting six students.

- Since FY2013, NJSGC has been supporting Community College Students deciding to go onto a 4-year program in Science and Engineering. NJSGC was the recipient of a Community College Award for \$500,000 which will be ending in September 2017.

Precollege Projects:

- NJSGC has been supporting EOF (Equal Opportunity Fund) programs at affiliate institutions. This initiative is a part of our bridge programs. The EOF programs brings students entering STEM fields to campus before their first semester and provides them with enrichment, as well as a small stipend.
- The TARGET (The Academy at Rutgers for Girls in Engineering and Technology) program sponsors female middle school students during the summer and introduces them to a hands-on engineering. NJSGC funds about 15% of the program.
- The GIST (Girls Involved in Science and Technology) program at Georgian Court University runs a summer science program for girls in the Lakewood, N.J. school district whose students are disproportionately minority. The emphasis during this one week program is hands-on, inquiry-based learning in the areas of biology, chemistry, physics, ecology, mathematics and computer sciences. Over 50 middle and high school girls participate, with follow-up and mentoring by GCU students and faculty.
- The bulk of our Pre-College programs consist of teacher training. In FY 2016, besides the New Jersey Astronomy Center for Education at Raritan Valley Community College, NJSGC is also funding pre-service science teacher training program, jointly run by Rutgers School of Education and Rutgers School of Engineering. STEM students begin taking education courses in their fourth year and receive a B.S. degree in a STEM field and a master's degree in education at the end of their fifth year.

Informal Education Projects:

- NJSGC supports informal education programs minimally, about 1% of its budget. Our informal education programs are primarily planetarium support at Liberty Science Center. We have also supported planetariums at Raritan Valley Community College, and at Rowan University.

E. PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE GOALS

*Include summary data for the bulleted list below:*

**Diversity:**

- FY2016 statistics are not complete, as this year we are continuing the transition from August 1 to May 1 as the start date of the budget year. Our statistics so far indicate that for the fifth year in a row, we will meet or exceeded our diversity targets in gender and diversity.
- NJSGC has geographic diversity, as well. From the north to the south, we have programs at most New Jersey colleges. We make efforts to ensure that each congressional district is represented among our award recipients.

**Minority Serving Institution Collaborations:**

- There are no historically black or other minority institutions in New Jersey. However, because of their location, there are two four-year institutions classified as minority serving. The largest is the New Jersey City University, which is an active affiliate of NJSJGC. The other has shown no interest in working with us.
- NJSJGC has continued supporting the RiSE program, where minority college students from across the country come to the Rutgers campus and conduct research. This year six students are being supported.
- New Jersey City University is minority serving and has a relatively large science program. We have partnered with them for fellowships and proposals. They have also helped us with contacts at community colleges.
- Bloomfield College has a sizable minority enrollment (nearing 50%). We support academic-year fellows at Bloomfield College.

**Office of Education Annual Performance Indicators:**

API 2.4.1: ED-16-1

- 32% are racially or ethnically underrepresented (24/76) NJ Target: 28%
- 46% are women (35/76) NJ Target: 45%
- 0% of disabled (0/76) NJ Target: 10%

API 2.4.2: ED-16-2 405 (Number of educators)

API 2.4.4: ED-16-4 22 (Number of informal education events)

API 2.4.5: ED-16-5 356 (Number of K-12 students)

Full statistics for FY2016 are not yet available as we are in the process of transitioning the grant start date from August 1 to May 1. Therefore we have used FY2015 statistics.

F. IMPROVEMENTS MADE IN THE PAST YEAR

- During FY2016, NJSJGC started a ballooning program at Rutgers University and a CubeSat program at Rowan University, while maintaining the Rock-SAT-C program at Stevens Institute of Technology.
- During FY2016, NJSJGC continued to increase alliances with community colleges, with our base award as well as the community college award. We visited Atlantic Cape Community College and have been running programs with Atlantic Cape. This community college is very important to NJSJGC, because of their proximity to the FAA Technical Center and because of their air traffic controller program.
- We also have greatly improved our relationship with the FAA. We are partnering with them to develop senior design projects at New Jersey colleges. Also, on February 1, 2017, Dr. Christina Young, a researcher in aviation safety, visited our lead institution and met with faculty and students. Haim Baruh has already signed a CRDA (Corporate Research and Development Agreement) with the FAA, which is the first step in improving contacts and joint research. While we cannot count FAA support as cost share match in our programs, as it is a Federal organization, we greatly value our collaboration.
- NJSJGC continues to expand its outreach efforts to attract and retain minority students in STEM. For five years in a row, NJSJGC has met or exceeded our targets.

- We also have made contact with the only large New Jersey college that is not part of our network, Montclair State University. We are in discussions with them as to how to support them in the future.

#### G. CURRENT AND PROJECTED CHALLENGES

The NJSGC programs and the NJSGC office are running smoothly. Our greatest challenge is to maintain the enthusiasm of our affiliates and to keep them involved. We have come to the realization that the activity level of an affiliate is very much in the hands of the affiliate representative and that we need to keep the affiliate representatives engaged at all times. One challenge we have faced this year has been the installation of a new university-wide accounting system at the lead institution that has lots of glitches. This has been delaying some of our disbursements.

Another issue associated with keeping our affiliates involved is the oscillation in the funding levels and the activities we can support at affiliate institutions. We have also found out that it is difficult to attract our affiliates to submit proposals for the competitive awards announced by the Space Grant Program Office.

#### H. PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

##### Affiliate Partners:

- Astronomy Center at Raritan Valley Community College. Very active, key player in our pre-college efforts.
- Bloomfield College. Active. Participates in our academic year fellowship program.
- Essex County College. Active we have supported fellowship programs from our base award as well as STEM clubs and research through our community college grant.
- Georgian Court University. Very active. Academic year fellowships, K-12 bridge programs and support of teacher workshops.
- NASA Summer Internship Programs at the Goddard Institute for Space Studies in NYC. While not an official affiliate, as it is part of a NASA center, we consider it an affiliate. Very Active. NJSGC runs multiple programs with them depending on the circumstances of that particular year.
- Liberty Science Center. Very Active. Our only non-academic partner. Participates with their Partners in Science program. We also support the LSC planetarium.
- New Jersey City University. Active. Designated minority-serving institution. We have partnered with them for responding to NASA solicitations.
- New Jersey Institute of Technology. Active, we have funded research programs and bridge programs for graduate study.
- Princeton University. Active, we have funded research programs with them and sent their students to NASA centers. Very highly ranked private university.
- Ramapo College. Active. Ramapo participates in our research clusters and we have made contacts with their science faculty.
- Rowan University. Very active. Research, fellowships, research clusters, and informal education.

- Rutgers Health and Biomedical Sciences. Beginning to become active. Formerly, University of Medicine and Dentistry of NJ.
- Rutgers, New Brunswick. Lead institution and very active affiliate.
- Rutgers Camden. Active. We have supported academic year and summer fellowships, as well as course development programs.
- Seton Hall University. Very active. They receive funding from our Academic Year Fellowships and also from our Research Clusters program.
- Stevens Institute of Technology. Very active and involved in most of our programs. Private university that provides undergraduate and graduate education in STEM topics.
- Union County College. Very active. They participate in the academic year fellowship program and in the community college grant.
- The College of New Jersey. Active. We have supported them with fellowships and research clusters. Small public college, with primarily undergraduate programs.

Non-Affiliate Partners:

- Princeton Plasma Physics Laboratory. Part of the Department of Energy, we have sent summer fellows there to work on research projects.
- RiSE - Research in Science and Engineering. This program, which is run by the Graduate School at Rutgers University, is a strong magnet to attract minority students to STEM and encourage these students to continue on to graduate school.
- As discussed earlier, our relations with the FAA have greatly expanded.
- The following community colleges, even though they are not listed as affiliates, have partnered actively with us, especially with regards to the community college grant: Atlantic Cape County, Brookdale, and Middlesex County College. We are currently making plans on how to continue supporting them in the future.