

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 2017.

#### 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: \$142,500 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: \$20,000 will be awarded through research fellowships to graduate students, through the NASA/NJSGC Graduate Student Fellowship program.
- Objective 1.3: \$62,500 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 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 2.1: 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 2.2: Allocate \$9,000 for an Industry Co-Op/Internship program for students to receive co-op or internship experience.
- Objective 2.3: \$20,000 will be allocated for the Aerospace Course Development program, for N.J. faculty to develop new college courses in aerospace and teach them.
- Objective 2.4: \$15,000 will be provided to New Jersey Universities for Summer Development programs for entering freshmen and for K-12 college bridge programs.
- Objective 2.5: \$6,000 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 2.6: \$35,000 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.
- Objective 2.7: \$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 3: 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 3.0: \$4,000 will be provided for Travel Support to students to attend scientific conferences.
- Objective 3.1: The Research Clusters and Mini Grants program will provide \$60,000 to research clusters in N.J. universities or to junior faculty in STEM. A very popular program.
- Objective 3.2: \$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 3.3: \$25,000 will be allocated for programs for Minority Student Development for Graduate Study (RiSE).

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 \$20,000 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: \$6,000 will be allocated for support of planetariums, science centers and new programs.

Goal 6: NJS GC 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: NJS GC will have an effective, efficient and frugal office which continuously monitors itself, and whose documents are up to date. NJS GC will have well-defined operational policies and procedures for all of its activities.
- Objective 6.2: NJS GC will have a set of active affiliates who contribute to the programs of the consortium by serving on committees, publicizing NJS GC activities at their organizations, and by recruiting students and faculty to apply for NJS GC awards.

Goal 7: NJS GC 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. NJS GC 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: NJS GC 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

NJS GC award recipients continue to make strides in their careers. In this year's APD we give you a glimpse of what some of our alumni are doing. For example, Aditya Hublikar, an FY2016 fellowship recipient, started medical school in Fall 2017. Revan Sopher, also of the same year, is now a software engineer at Google. Carly LaGrotta (FY2015) is now in the Ph.D. program in mechanical engineering at Columbia University. Danielle Howe (FY2015) is a Ph.D. student in biomedical engineering at the University of North Carolina/North Carolina State. Michelle Chernick (FY2013) is conducting research at Stanford University in their Space Rendezvous Laboratory.

Michael Pavlou (FY2013) will be defending his doctorate at Rutgers in the next three months. He has conducted cutting-edge research in the modeling and analysis of retinal detachment in humans. The model he uses is an extension of a model first developed at Rutgers using delamination theory of composites.

Dan Cordasco (FY2013) has finished his doctoral studies at Rutgers and he is a member of the technical staff at the Federal Aviation Administration, working on fire safety.

Matthew Frenkel's (FY2012) research led to his Ph.D. degree and was prominently featured on the cover page of the Journal of Polymer Physics. He now is working in industry.

Jennifer Coulter (FY2015) completed her undergraduate studies and received an NSF fellowship to do a Ph.D. in physics at Rutgers University.

#### 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 have match from the student's institution. 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 held on the afternoon of 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 2017 had the highest attendance by the general public in our history.
  - ❖ NJS GC considers all fellowships it gives out as major awards and tracks the fellowship recipients.  
Please note: The beginning of the grant date of NJS GC was changed from August 1 to May 1 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 FY2017, we supported travel support for the "Solar Splash Competition" and "The Formula SAE Competition" both entered into by Stevens Institute of Technology. Matching funds were provided by Stevens.
  - ❖ An autonomous airplane project by the AIAA student section at Rutgers, as well as at Rowan is underway. We are currently working on expanding that program statewide and so as to have a statewide local autonomous aircraft competition in the near future.
  - ❖ 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 was taught in the Fall 2017 semester at Rutgers. Stevens developed a course in

- Advanced Gas Dynamics, which will be a follow up on a course on compressible flow also offered at Stevens.
- ❖ With the introduction of the B.S. degree program in Aerospace Engineering at Rutgers, which was done with support from NJSGC, the number of engineering students interested in aerospace has increased substantially. This has led to the development of student organizations with interest in aerodynamics, flight, aviation, and space flight. NJSGC has started supporting the activities of these student organizations.
  - ❖ NJSGC continues to participate annually in the Rock-SAT-C program and has done so since 2012. 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. To expand NJSGC's hands on programs, a ballooning project was introduced last year at Rutgers University, and a CubeSat program was introduced at Rowan University. The ballooning program has continued to grow and we anticipate providing them with a third-year support in FY2018.
  - ❖ 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 FY2017.
  - ❖ NJSGC has been supporting EOF (Equal Opportunity Fund) programs at affiliate institutions. This initiative is a part of our bridge programs. The EOF programs bring 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 Partners in Science (PIS) program at the Liberty Science Center matches high school students with mentors in academia and industry for a summer of research and exploration. The Liberty Science Center has resources for placing such students statewide.
- Research Infrastructure projects:
    - ❖ Research clusters in FY2017 are at Rowan, Rutgers, Seton Hall, Stevens, TCNJ, and Ramapo College/NJIT. Approximately 40 students are supported (at Rowan, Rutgers, Seton Hall, Stevens, TCNJ, and at Ramapo/NJIT). The research clusters program has become very popular program.
    - ❖ 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 ended in September 2017. NJSGC has budgeted \$7,000 for Community College Research and will make available its other programs, where appropriate, to community colleges.
- Precollege projects:
  - ❖ The bulk of our Pre-College programs consist of teacher training. In FY 2017, besides the New Jersey Astronomy Center for Education at Raritan Valley Community College, NJSGC is also supporting 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.
  - ❖ A new teacher training program that we have started in FY2017 is the Up, Up and Away program at Alexandra Field, a small airport in Pittstown, N.J. Our support will go towards the training of K-12 teachers in aviation and bring to their classrooms projects in aviation, flight, and airport management. It is our understanding that the Up, Up and Away program has, in the past, received support from the Idaho Space Grant Consortium.
- 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 and at other institutions. 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:**

- FY2017 statistics are not complete, as we still are continuing the transition from August 1 to May 1 as the start date of the budget year. Therefore we are submitting 2016 statistics. Our statistics so far indicate that for the fifth year in a row, we will come very close to or exceed our targets in diversity. We need to redouble our efforts to meet our gender targets for 2017.
- 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. We also regularly contact colleges that are not part of NJSGC. In FY2016, we have made attempts to involve Montclair State University and Stockton University.

##### **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 NJSJG. The other has shown no interest in working with us.
- NJSJG has continued supporting the RiSE (Research in Science and Engineering) program, where minority college students from across the country come to the Rutgers campus and conduct research. This year five 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-17-1

- 28.4% are racially or ethnically underrepresented (31/109) NJ Target: 28%
- 41.3% are women (45/109) NJ Target: 45%
- 3.6% are disabled (4/109) NJ Target: 10%

API 2.4.2: ED-17-2     410                     (Number of educators)

API 2.4.4: ED-17-4     22                             (Number of informal education events)

API 2.4.5: ED-17-5     355                             (Number of K-12 students)

Full statistics for FY2017 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 FY2016 statistics.

F. IMPROVEMENTS MADE IN THE PAST YEAR

- During FY2016, NJSJG 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.
- We also have greatly improved our relationship with the FAA. We are partnering with them to develop senior design projects at New Jersey colleges. 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. During the academic year 2017-2018, two Rutgers students are doing a project with the FAA on “Separation Standards Analysis.” While we cannot count FAA support as cost share match in our programs, as it is a Federal organization, we greatly value our collaboration.
- NJSJG continues to expand its outreach efforts to attract and retain minority students in STEM. For five years in a row, NJSJG has met or exceeded our targets.
- We are on track to become a paperless office. We have not purchased any printing paper in over two years (we did not have a large supply to begin with).

## 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 many peculiarities. 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.

With the end of the community college grant, we have the challenge of finding support for community colleges that we have worked with in the past. While finding funds for these institutions has not been an issue (as our start date was changed from August to May a couple of years ago), because every program in the Space Grant base award has to have match, our community college partners have had a hard time to obtain match from their institutions or from other sources. We are working with them to identify sources of match.

## 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. This year, we have two students doing research on separation standards (vertical separation of airplanes) with the FAA.
- 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.