

FY 2018 Year 4 Extension Annual Performance Document

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 2018.

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 underrepresented minority students. 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 NJS GC 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. NJS GC 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, Princeton University, 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: 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

NJSGC 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, Corinne Yap (FY2017) is pursuing a Ph.D. in mathematics at Rutgers. Ana Gurski (FY2017) is a system engineer at Lockheed Martin. Edward Izett (FY2016) is pursuing a doctorate in chemistry at Rutgers. Michael Soskind (FY2016) is a doctoral student in chemistry at Princeton. Annemarie Thomas (FY2016) is working as a mechanical engineer at ExxonMobil. Cara Mawson (FY2016) has decided to become a STEM teacher and is working at Camden's Promise Charter School. Logan Stahl (FY2016) did an internship at NASA Glenn. As our student data tables show, New Jersey students have been very loyal to their STEM careers.

On February 5, 2018, the peer tutor program at Brookdale Community College had a kick-off event inviting STEM students to meet with their NJSGC-funded tutors.

Mark Trevana (FY2017), after working on research on systems engineering, graduated and now works with the Patriot Missile system.

Summer Fellow Ankur Dalsania (FY2017) published a paper in the peer-reviewed Journal of Materials Chemistry as the principal author.

Jade Alvarez (FY2017) was invited by the NJSGC team to present her research at the Fall 2018 Space Grant Directors meeting in Stowe, Vt. She participated in the poster session. As a result of the conversations she had with Space Grant directors, Ms. Alvarez decided to pursue graduate studies upon graduation in May 2019. She is currently evaluating her options and she is most likely to pursue a master's degree in astrobiology with the Pathways to the Ph.D. program of NIH.

D. PROGRAM ACCOMPLISHMENTS

- NASA Internships, Fellowships, and Scholarships (NIFS):
 - ❖ NJSGC runs three fellowship programs: Undergraduate Academic Year, Summer and NASA Internships, and Graduate. This year, we expect to support around 42 fellows, and to send one student to a NASA Center.
 - ❖ While fellowship programs do not require match, NJSGC requires graduate fellowships to have match from the student's institution. Match makes the stipends more attractive.
 - ❖ NJSGC 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 NJSGC annual affiliate meeting. The second meeting is in August, where the summer fellows and research cluster participants make presentations. The poster session in Spring 2018, which was held at Georgian Court University, had the highest attendance by the general public in our history.
 - ❖ NJSGC considers all fellowships it gives out as major awards and tracks the fellowship recipients.
- 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 FY2018, 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 and Fall 2018 semesters 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 supported in part by 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 is supporting the activities of these student organizations. We sent two rocketry groups to New Mexico (SpacePort) in summer 2018 to conduct a successful launch.
 - ❖ 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. We continue to expand NJSGC's hands on programs. In summer 2018, we supported two rocketry programs, one at Rutgers and one at Princeton University. Our CubeSat program at Rowan University is still continuing and we currently are in discussions with Princeton University to establish a CubeSat program there. The ballooning program has not been active 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 FY2018.
 - ❖ 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.
- Research Infrastructure projects:
 - ❖ Research clusters in FY2018 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. This year, we brought Rutgers Newark into our research and outreach programs. A group of four Rutgers Newark students, under the supervision of Prof. Ed Bondar, participated.
 - ❖ 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. In FY2018, NJSGC supported five 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. In FY2018, NJSGC supported three community colleges with research programs: Middlesex CC, Essex CC, and Brookdale CC. We also have ongoing discussions with Atlantic Cape, Union County and Passaic County.
- Precollege projects:
 - ❖ The bulk of our Pre-College programs consist of teacher training. In FY 2018, 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 in FY2018 was the Up, Up and Away program at Alexandra Field, a small airport in Pittstown, N.J. Our support went towards training of K-12 teachers in aviation so they can bring to their classroom's projects in aviation, flight, and airport management.
- 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 in the past.
 - ❖ We are in talks with several of our affiliates to run activities in commemoration of the 50th anniversary of the Moon Landing. Rowan University and Princeton University will be having seminars by astronauts and space researchers in March and April 2019. The bulk of our Apollo-related activities will take place during the summer of 2019, primarily at Rutgers University and at the Liberty Science Center

E. PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE GOALS

Include summary data for the bulleted list below:

Diversity:

- FY2018 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 2017 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. There has been a small drop in female participation in FY2017 and we have been working hard to meet our gender targets for 2018. On the other hand, because of population shifts in New Jersey, there has been a sizable increase in minority enrollment at New Jersey Universities. Our goals for FY2018 were the same as previous years but we are looking at increased minority percentages for FY2019.

- 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 FY2017, we have made attempts to involve Montclair State University and Stockton University. Stockton joined us in FY2018. With Montclair State, because of a change in personnel that involved our contact there, our efforts were not successful. We will try again in FY2019.

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 NJSGC. The other has shown no interest in working with us. In recent years, a few other New Jersey Institutions have been classified as MSI. They all are our affiliates.
- NJSGC 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. In FY2018, five students were 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 3.3.3: STEM-18-1 Provide Significant, direct student awards in higher education
 - (1) Students across all institutional categories and levels: 105
 - (2) racially or ethnically underrepresented students: (30/105) 28.6% NJ Target: 37.4%
 - (3) women (50/105): 47.6% NJ Target: 45.0%
 - (4) person with disabilities (4/105): 3.8% NJ Target: 10.0%
- API 3.3.5: STEM-18-5: Contribute to American technical capability by supporting the release of at least 1,200 paper presentations and peer-reviewed research publications through National Space Grant College and Fellowship Program to Stimulate Competitive Research (EPSCoR), and MUREP investments. We have not had the opportunity to participate in these programs.

F. IMPROVEMENTS MADE IN THE PAST YEAR

- Since FY2016, NJSGC has significantly increased its funding of hands-on projects for New Jersey students. In FY2018 we supported two new rocketry programs and we started initial steps of establishing a second CubeSat program in New Jersey.

- NJSGC continues to expand its outreach efforts to attract and retain minority students in STEM. For five years in a row, NJSGC has met or exceeded our targets.
- We have become an essentially paperless office. We have not purchased any printing paper in over three years. We have maintained a very frugal operation and our administrative expenses are below the Space Grant average.

G. CURRENT AND PROJECTED CHALLENGES

The NJSGC programs and the NJSGC office are running smoothly. We continue to expand our organization. Our greatest challenge is to maintain the enthusiasm of our affiliates and to keep them involved. The activity level of an affiliate is very much in the hands of the affiliate representative and we need to keep the affiliate representatives engaged at all times. One challenge that continues is the accounting and procurement system at the lead institution, which always is delayed in sending invoices to NASA.

Another issue associated with keeping our affiliates involved is the fluctuation in 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 continuing our relationships with community colleges we have worked with. While finding funds for these institutions has not been an issue (as we have a small carryover reserve), 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 and we have supported fellowship programs from our base award as well as STEM clubs and research.
- 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 and partner with them for summer programs.
- Liberty Science Center. Very Active. Our only non-academic affiliate. 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. We also support a rocketry program there.
- Ramapo College. Active. Ramapo participates in our research clusters.
- Rowan University. Very active. Research, fellowships, research clusters, and informal education.
- 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.
- Rutgers Newark. We began to support a research and outreach program there.
- 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.
- Stockton University. New affiliate and we have been sponsoring two hands-on student projects. We have funded one and we expect to fund the other in FY2019.
- Union County College. 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. Not very active in last two years.
- 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 expanded but slowed down in FY2018. We plan to reinvigorate in FY2019.
- 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 College, Brookdale Community College, and Middlesex County College. We are currently making plans on how to continue supporting them in the future, as well as on increasing our community college involvement.