New Jersey Space Grant Consortium
Rutgers University
Haim Baruh, Ph.D.
732-445-2410 or 732-445-4462
URL: http://njsgc.rutgers.edu/

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 **$590,000** for fiscal year 2009.

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.
Goal 2: To promote research activities in New Jersey that are 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.
Goal 3: To produce diverse and well-educated college graduates in STEM fields who will be inspired by their NJSGC experience and who will be motivated to pursue careers in STEM and aerospace, as well as graduate education, thus creating a pipeline to the STEM workforce. To nurture interdisciplinary approaches and to develop higher education networks.
Goal 4: Keeping in mind New Jersey's chronic shortage for science teachers and the state astronomy standards imposed on the K-12 curriculum statewide, to inspire, motivate, and improve the quality of New Jersey's math and science teachers by means of teacher training, educational outreach and professional development programs.
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.

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 will be pursued.
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 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 other states, supporting them with funding, fellowships and internships.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1, 2, OR 3)

Below we initially list each of New Jersey Space Grants Programs and Projects and then explain of their alignment with NASA's Education Outcomes 1, 2, and 3.

New Jersey Space Grant Program / Project	Outcome		
	1	2	3
Fellowships	Educate & Employ	Engage & Educate	Inspire & Engage
Graduate Student Fellowship	x		
NASA Academy	x		
NJSGC Summer Fellowships	x		
Academic Year Fellowships	x		
Research Programs			
Industry-University Research	x		
Collaborations w/Centers	x		
Mini Research Grants	x		
Higher Education			
State Aerospace Design	x		
Co-Op Programs	x		
New Course Development	x		
Minority Graduate Student	x		
New York City Research Initiative (NYCRI)		x	
Rock-On Program		x	
Pre-College			
Teacher Training at RVCC		x	
Buehler Challenger Center		x	
Informal Education			
Traveling Planetarium			x
Lectures			x

NASA Resource Center			x
New Initiatives			x

Fellowships

NJSGC's fellowship and scholarship programs provide graduate as well as undergraduate research and educational opportunities to a diverse spectrum of New Jersey students in STEM disciplines with emphasis on aeronautics and space science. Research opportunities at NJSGC member universities are available as summer and academic year fellowships for graduates and undergraduates while undergraduate fellowships are available at NASA centers and NASA Academy.

The fellowship programs introduce students to the synergies of work and research providing them with actual "working world" experiences while simultaneously educating them. For those students who work in a NASA environment, the projects are more demanding since the deliverables more closely mirror those of a working environment.

We have four types of fellowships: Undergraduate Academic Year, Undergraduate Summer, Graduate, and NASA Academy/Centers.

Research Programs

The research programs of the New Jersey Space Grant Consortium are relevant to NASA's needs and interests and in sync with New Jersey industry. We build research networks and create pipelines from research to industrial development while supporting STEM workforce development in support of NASA education outcome 1. Preferences are to support junior faculty and graduate students in research and to increase diversity among researchers and among graduate students.

NJSGC offers an Industry University Research Program (IUR) which amalgamates the research that New Jersey industrial corporations need with projects that are of benefit to NASA. Each project requires an industrial partner and involvement of a NASA center so that there is a three-way affiliation among a university, a corporation and NASA. Some faculty members continue to perform research activities for the sponsoring corporation upon completion of the initial award.

Our mini-research grant has proved useful as a start up package for new junior faculty hires supporting them in STEM and aerospace research. The grant recipient is required to write a report and inform NJSGC of any grants and publications that arise from the research. The mini-research grants are smaller in scope than NJSGC's IUR program. They provide summer support and start-up funds to junior faculty in STEM areas in New Jersey.

Finally, NJSGC has been expanding its collaborations with aerospace and STEM centers at our member institutions. Our support is in the form of co-sponsoring conferences and publications. The program serves to deliver the results of research conducted to conference attendees and to publicize the activities of the center.

Higher Education

NJSGC's higher education program is comprised of six activities. The goal of all of our higher education programs is to produce diverse and well-educated college graduates in STEM fields who will be inspired by their NJSGC experience and who will be motivated to pursue careers in STEM and aerospace, as well as graduate education, thus creating a pipeline to the STEM workforce.

Our Higher Education program spans both NASA education outcomes 1 and 2 for the purpose of engaging and educating K-12 students and educating and employing high school seniors, undergraduate and graduates each at increasing levels of difficult in the work environment.

The NJSGC Co-Op program integrates learning, as all entry level working experiences do, with hands on development work at a NASA contractor or other aerospace company for undergraduates in their sophomore or junior year.

The New York City Research Initiative (NYCRI) program aligns high school students, college undergraduates or graduate students and a high school teacher in a working research environment for six summer weeks. This program fully integrates NASA education outcomes 1 and 2. Also, while this program is run out of the NYCRI offices in New Jersey, the participants that we sponsor are mostly New Jersey students.

The Research in Science and Engineering (RiSE) program specifically addresses the needs of minority undergraduate and graduate students. Through a focused summer program, RiSE trains and encourages promising undergraduate students in STEM disciplines, particularly those from historically underrepresented groups or economically/educationally disadvantaged or underserved backgrounds, to attend graduate school and pursue research careers.

The three remaining NJSGC programs are: Senior Design, Course Development and the Rock-On programs. The senior design program provides support to senior design projects in N.J. universities for project supplies. The course development program awards grants to higher education institutions to develop new STEM courses, especially related to astronomy, aeronautics and space sciences. We provide more details on the course development program later on in this report. We have participated in the Rock On program for the first time this year and plan to make rocketry projects a greater focus of NJSGC in future years.

Pre-College

The NJSGC pre-college programs consist primarily of teacher training activities for K-12 science and math teachers. The State of New Jersey's astronomy standards were instituted into the K-12 curriculum statewide several years ago at every grade level. In addition, New Jersey has a chronic shortage of science teachers. Towards the end of fulfilling both needs, our affiliate, The New Jersey Astronomy Center for Education (NJACE) at Raritan Valley Community College (RVCC) has designed over two dozen teacher professional development programs. These programs range from one-day workshops to three-day astronomy institutes which are offered to pre-service and in-service teachers. The goal is to strengthen their existing STEM knowledge and to inspire them to become better teachers. While the focus is astronomy other STEM topics are taught. While in the past we have primarily supported teacher training programs at RVCC, we will, in the future, be supporting additional K-12 science teacher training programs. Our support is primarily in the form of subsidizing teacher tuition.

A second pre-college program that we supported exposes the public, especially children and educators to the challenges of space exploration. That award was given to the Buehler Challenger Center. The challenger centers were established nationwide with assistance from NASA after the "Challenger Disaster." A space simulator is used to provide a virtual environment for space exploration with the students and the educator participating -- playing various roles of the space vehicle and ground crew. Basic concepts of astronomy as it pertains to particular aspects of space exploration are also included as part of the experience. As with the teacher programs at NJACE, this program will assist the state of New Jersey with the implementation of the astronomy standard.

Both programs serve as vehicles to engage and educate which is aligned with NASA education outcome 2.

Informal Education

NJSGC seeks 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 and promote awareness of NASA's mission and its contribution to society. Towards that end, NJSGC has supported a traveling planetarium acquired by the Plainsboro Public Library. In addition, guest speakers as well as permanent NJSGC staff are used to present lectures to educate the public on relevant astronomy topics.

A third Informal Education program is in the form of a small grant to the NASA Educator Resource Center (ERC) at Georgian Court University to offer a summer workshop. This program is evolving from an informal education program to a pre-college program. In future years, we will be classifying it as a pre-college program as a lunar certification workshop, which enables teachers to borrow lunar / meteorite discs for classroom use.

All of NJSGC's informal education programs are aligned with NASA Education Outcome 3.

PROGRAM ACCOMPLISHMENTS

- During the 2009 program grant year, the NJSGC emerged from reestablishment and underwent substantial restructuring and expansion of the consortium network. The NJSGC personnel consist of Haim Baruh, Ph.D., as the Director, Mr. Joseph S. Miles, as the Program Coordinator, and Ms. Aiesha Long, as the Project Coordinator. Our main office is at the lead institution, Rutgers University. We also maintain a branch office at Stevens Institute of Technology, where Mr. Miles is located.
- The management team conducted numerous meetings on campus, as well as visits to NJSGC affiliates and potential members, thus forging several new statewide affiliations. In the process, the consortium expanded from five to thirteen affiliate members in two years. We expect NJSGC to grow to about fifteen members in the near future.
- We established contacts with New Jersey community colleges. While all the contacts were not successful, we believe that we have developed an excellent working relationship with Essex County College, which is located in Newark, N.J. and has a significant (over 70%) minority enrollment. We will be giving them fellowship support and course development support in FY 2010. We are in discussions to provide even more support.

- We have taken action to replace campus representatives who are unresponsive with faculty who better appreciate the benefits of closer association with and receiving funds from NJSGC. We have had a markedly better relationship with Princeton University since the appointment of their new campus representative, Prof. R. Miles. We are currently working on a new campus representative for the University of Medicine and Dentistry, whose excellent campus representative is leaving New Jersey.
- We responded to RFPs for the Summer of Innovation (unsuccessful) and the Space Grant Development competition (results not announced yet).
- For significant funds awarded and tracked, NJSGC slightly exceeded it's underrepresented minority guideline of 28% by awarding funds (Direct Funded) to 36% underprivileged and the disadvantaged. Historically, NJSGC's record for awards to the underprivileged and disadvantaged was approximately 12%. We attribute this welcome increase to our collaboration with N.J. City University, in Jersey City, which has a sizable minority enrollment, increased publicity of our programs, and increased support for the RiSE program at Rutgers, which is a minority student development program for graduate study. In addition, the two top applicants to our graduate fellowship program were minorities.
- For significant funds (Direct Funded) awarded and tracked by gender, NJSGC's 2009 awards are recorded at 33% female. Unfortunately, this is below the 45% target that we have. While many female candidates were offered fellowship and support opportunities by NJSGC, some candidates declined our offers due to more lucrative offers. There will be a renewed focus on attracting female students to NJSGC programs in FY2010.
- Both the minority and female numbers are lower when we consider direct participants. We expected this, as we do not have as much control over who the students are in the groups that receive our funding. We will make additional efforts in FY 2010 to improve this record, especially our record with females. The table below shows our diversity and gender record in awards made to students:

	NJSGC Target	Direct Funded	All Direct
Minority	28%	36.7	27.1
Female	45%	33.3	25.0

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- While not requested in the data, our diversity record in funding faculty members is 25% for females and 25% for minorities.
- We introduced 12 new programs, raising the total number of programs to nineteen, while we retired several outdated programs.
- A new web site for NJSGC has been developed, with up to date information and a gallery showcasing our activities. (http://njsgc.rutgers.edu/). We now have a presence on Facebook, as a way to reach more New Jersey students. We are working on an internship and job opportunity database, which should go online in the next three weeks.
- Our students presented their research in three venues in summer of 2010. In the well-attended summer fellowship conference, 10 undergraduate fellows presented the results of their summer research. The three students supported in the RiSE program successfully presented their research at the RiSE symposium, and students in the New

York City Research Initiative program (three groups, each group has a high school student, a K-12 teacher, and a college student)—presented their research posters. In total, over thirty fellows, faculty, and sponsors attended NJSGC supported functions.

- The expansion of our K-12 teacher training programs to meet the State of New Jersey's K-12 astronomy standards.
- The continued engagement of our elected Senate and House representatives helped publicize our programs.
- We developed new databases to be used in the management of the consortium and for longitudinal tracking. We introduced a pledge form for all NJSGC awardees (asking them to pledge to provide us with their whereabouts and career progressions for 10 years after the completion of their projects).
- We are in the process of forming an advisory committee. Unfortunately, we have had several rejections from people whom we have approached to lead this effort. We will continue our efforts in FY 2010 to develop an advisory committee.
- We have had increased contact with the N.J. Department of Higher Education, especially with their science coordinator, Mr. Michael Heinz. We collaborated with him while preparing the Summer of Innovation proposal. As the Summer of Innovation becomes an integral part of the NASA Education Framework, we at NJSGC would like to contribute, using the networks we have developed. We have already helped an after school program that we met during the Summer of Innovation proposal preparation in developing a proposal.
- We have had some difficulty in making certain awards due to timing issues and misunderstandings. For example, by the time we received the FY 2009 award and prepared the announcement for the Academic Year Fellowship program, it was mid October. We were into the academic year, and it became very difficult to find interested parties for yearlong fellowships. Also, based on management models of other consortia, we decided to administer the Academic Year Fellowship program as block grants to universities. Because we are in the first year of a block grant program, some campus representatives were not able to implement the program successfully. As a result, half of our academic year fellowships were not awarded (which explains the lower than expected numbers of our fellowship recipients). We will be making those awards this academic year. We just received notice of our FY2010 funding and we have already issued the RFPs for the academic year fellowships. We have gained a lot of experience in the past year and expect to deal with such issues more successfully from now on.
- Another area where we gained a lot of experience was in dealing with subcontracts and making awards to students (especially fellowship recipients who are not Rutgers students). Space Grant is a different type of grant than the Office of Research and Sponsored Programs at Rutgers was accustomed to administering. We spent a lot of time explaining our budget and award making process to Rutgers bureaucrats. We expect that aspect of our consortium to run much more smoothly in the future.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- Longitudinal Tracking: NJSGC has instituted an aggressive longitudinal tracking program beginning with the 2009 grant year. Tracking data is available for our 2005 award, but in this report we are being asked to report on awards for 2006, 2007, and

2008. We were not funded during those years. NJSGC was in reestablishment mode during the 2006-2008 time frame.

- Course Development: Our FY2009 proposal budgeted three grants for course development. We made two awards and we are awaiting their outcome, which should be courses that will be taught in the Spring 2011 semester. We will make the remaining award in the FY 2010 cycle. We have had some discussions with Essex County College for developing an astronomy course there, in conjunction with the Newark Museum, which has a planetarium.
- Matching Funds: Explaining match to proposers statewide and to grants officer at other universities has been a challenge. We have been strict on insisting for meaningful amounts of match, and have not been satisfied with lip service as match. In general, though, our match process has gone on smoothly.
- Minority-Serving Institutions: NJSGC has identified Essex County Community College as a well run organization with which we have begun to work after a campus visit this summer. We have offered to fund development of a course in conjunction with the Newark Public Library and we await the results. We also have discussed academic year fellowships and we have put in an item in our Consortium Development Proposal for laboratory improvement. ECC mechanics lab improvement will be one of our awards in case our Development Proposal is successful.
- The New Jersey City University is listed as an institution with "High Hispanic Enrollment" and NJSGC has invited them to membership in the consortium. They accepted. We are very lucky that we have a very active campus representative there, Prof. Alberto Pinkas. We have begun our affiliation by awarding NJCU an academic year fellowships and will see what interests develop as we move forward. They have successfully implemented the academic year fellowship program and in FY2010 we will be funding them at a higher level.

IMPROVEMENTS MADE IN THE PAST YEAR

Since NJSGC was in reestablishment mode for 2006, 2007, and 2008 all the items listed in the program accomplishment section should be viewed as prior year improvements. The improvements that we have made were outlined earlier when discussing program accomplishments.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

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. One of the objectives is to create a STEM pipeline into graduate study, where it is well known that minority enrollment is even lower than undergraduate enrollment. We are delighted with our relationship with the RiSE program and we have increased our budget for them in FY 2010.

Essex County Community College and Newark Public Library - NJSGC is in the process of supporting an integrated course development program with these two institutions. It is expected that a course in astronomy will be developed at Essex County Community College and be given at the Newark Public Library since they are in very close proximity-blocks away. The Newark Public Library has a planetarium and is situated in a high minority area of the state.

Center for Structures in eXtreme Environments - The focus of the Center for Structures in Extreme Environments is the study of structures that are exemplary of the human spirit for exploration and advancement - whether it be the exploration of space, the settlement of the Moon and Mars, or pushing the frontiers of understanding and development of the ocean - we are glad to be a part of a very exciting aspect of the human adventure. NJSGC supported a symposium.

Hamilton Sundstrand Corporation offers students an opportunity to experience a co-op environment by working half a year in STEM industry and half a year attending college. All projects are NASA ESMD approved before they are undertaken. Current projects consist of "Extravehicular Mobility Unit (EMU), Primary Life Support System (PLSS) Certification" and "Sabatier System" and the "Constellation Space Suit Project."

Buehler Challenger Center: The challenger centers were established nationwide with assistance from NASA after the "Challenger Disaster." NJSGC supports K-12 teacher development for this partner.

Middlesex County College: NJSGC approved a subcontract to them for an astronomy course development and we await its implementation.

Liberty Science Center: We have had informal discussions and will be formalizing our relationship for the support of teacher training and informal education programs.