

Massachusetts Space Grant Consortium  
Massachusetts Institute of Technology (Lead Institution)  
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<http://web.mit.edu/masgc/www/index.shtml>

### 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 Massachusetts Space Grant Consortium (MASGC) is a Designated Consortium funded at a level of \$730,000 for fiscal year 2008.

### PROGRAM GOALS

**Outcome 1 Goals and Objectives: Contribution to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals.**

1.1 Faculty and Research Support – Provide support to faculty, researchers and post-doctoral fellows by supporting students to work with them on research projects.

1.2 Student Support – Provide NASA competency-building education and research opportunities by way of research fellowships to the maximum number of Massachusetts students, as possible, to prepare them for employment at NASA, the aerospace industry, and higher education.

1.3 Student Involvement Higher Education – Provide opportunities for groups of post-secondary students to engage in authentic NASA-related mission-based R&D activities, by recruiting the best students from our consortium to participate in NASA programs.

1.4 Course Development – Develop and put into practice university-level academic course resources at MASGC affiliate institutions.

1.5 Targeted Institution Research and Academic Infrastructure – Leverage research funding in the state to enable institutions to conduct cutting edge research and development work for NASA.

**Outcome 2 Goals and Objectives: Attract and retain students in STEM disciplines through a progression of educational opportunities for students and teachers.**

2.1 & 2.2 Educator Professional Development (short- and long-term) – Provide continuing in-service opportunities to help teachers maintain competency in STEM instruction and encourage teachers to incorporate STEM instruction in their classrooms.

2.3 Curricular Support Resources – Ensure that Massachusetts teachers and students know how to access the wealth of available NASA educational materials.

2.4 Student Involvement(K-12)– Encourage/enable students to feel a personal connection with NASA missions.

2.5 Diversity – Extend Space Grant programs and opportunities to the broadest possible cross-section of the Massachusetts population, particularly encouraging participation by women and minorities.

**Outcome 3 Goals and Objectives: Build strategic partnerships and linkages between STEM formal and**

**informal education providers that promotes STEM literacy and awareness of NASA's mission.**

3.1 Resources – Assist our informal education affiliates in enhancing STEM proficiency, publicizing STEM career opportunities, and educating about NASA's mission activities.

3.2 Professional Development for Informal Education Providers –Recognize the important role played by informal educators by supporting them as we do teachers in incorporating STEM activities into their programs.

3.3 Informal Education Provider Involvement Opportunities – Help MASGC's outreach partners present the full breadth and depth of NASA's missions to Massachusetts informal educators.

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

**OUTCOME 1**

Higher education is at the top of our priorities and received the largest allocation in our budget. We awarded almost all higher education funding as fellowships, given directly to students, which avoids institutional overhead charges. Although our proposed amount for fellowships is in excess of the mandatory requirements by Space Grant, it is the wisest use of Space Grant resources, given the large higher education establishment in Massachusetts. Further, faculty, researchers and post-doctoral fellows in Massachusetts have traditionally been extremely successful in attracting NASA research funding. Therefore, MASGC has made a major policy decision not to act as an alternate source of direct NASA research funding for faculty. Instead of funding a small number of large research grants (formerly done as sub-contracts to a few MASGC affiliates), MASGC now distributes most of its research and higher education funding as small research fellowship grants to students, each of whom is sponsored by a faculty member or researcher at an affiliate institution. This helps both faculty and students, meeting the objectives of this outcome as evidenced by a message from a representative of one of the member institutions, Professor George Greenstein at Amherst College:

*I am attaching a letter from a senior at Amherst College, who has been totally lit on fire by his work. Best Wishes, George*

*21 November, 2008*

*To the Massachusetts Space Grant Consortium:*

*This is to thank you for the support you have provided for my research project. I have been involved with the group building an atomic emission spectrometer called ChemCam to go on the Mars Science Laboratory. While my attention has been primarily with the science team, I was able over the past summer to work with both the scientists and the engineers on the project. This was truly an exceptional experience, and I am the first to recognize how lucky I was to be able to have it. The work was intellectually stimulating and fun; combining chemistry, geology, astronomy, and math--all the things I like best. It has helped me to focus a somewhat unfocused liberal arts education. My time at the Los Alamos National Lab this past summer made possible by the Massachusetts Space Grant Consortium was so successful that I am continuing the work as my honors thesis in the Astronomy Department at Amherst College, and I even plan to stay with the project for a few more years after graduating. This has been a remarkable opportunity for a student, especially an undergraduate, and I sincerely express my gratitude for it.*

*Sincerely,*

*Jonathan Tucker  
Amherst College, Class of 2009*

MASGC continued to recruit the very best students from the state for NASA programs. On the average, MASGC has supported 3 students each year at the NASA Academies and has provided staff support every year for final academy selections. MASGC continues to make special efforts to attract minority students to these programs.

MASGC has advertised its program opportunities as widely as possible, to attract students from diverse backgrounds from all of our member institutions. The Consortium's members include Holyoke Community College, which serves a large number of economically disadvantaged students, and Roxbury Community

College, the only designated “minority-serving institution” in the state. Attracting community college students to space-related activities is challenging, because space is a field of endeavor most of the students have not thought about. Therefore, MASGC offered fellowships and a STEM seminar series to community college students, to encourage them to enter the aerospace workforce pipeline. It is, in effect, a "Scholarship for Service" program for the inner city minority population in Massachusetts.

The following are messages received from undergraduate and graduate students to evidence the impact of space grant funding in a number of ways ranging from continuing graduate research to contacts with NASA with a career in mind:

*Space Grant has provided me funding to begin my PhD work. It also encouraged further interaction with NASA. I am applying for a GSRP fellowship.*

*Andrew Stout, PhD student, UMass*

*Because of space grant, I was able to dedicate more time and resources to research of multi-agent systems than I otherwise would have. I am hopeful that the research directions from this fellowship will be beneficial to my career, but more importantly, that the efforts of myself and the research community as a whole will be beneficial to NASA as well as other organizations.*

*Alan Carlin, Masters student, UMass*

*The NASA Space Grant has allowed me to continue my doctoral research in developing smart learning algorithms and programming techniques for complex robot systems such as the NASA-JSC Robonaut. I have begun the application process for my post-doctoral job, and the research I have continued under the Space Grant has allowed me to apply to various NASA centers such as JSC and Ames.*

*Stephen Hart, PhD student, UMass*

*With the grants I received from MA Space Grant, I was able to start and continue my research for my Master's thesis. I am currently in the process of finishing my thesis on possible terrestrial analogs for the magnetic anomalies on Mars. Because of my research and thesis, I was accepted to the PhD program at UMass Amherst. The grants made it possible for me to continue my pursuit of a higher degree.*

*Kathryn J Murdock, Masters student, UMass*

## OUTCOME 2

In order to provide professional development and training opportunities to educators, and to equip them with the skills and knowledge to attract and retain students in STEM disciplines MASGC supported teacher development for NASA Explorer Schools and special education teachers. MASGC conducted these workshops in partnership with our outreach affiliates: the Boston Museum of Science, the Christa McAuliffe Challenger Learning Center and Project Astro.

Each year, MASGC holds Space Day at the Boston Museum of Science for high school students from local and inner-city high schools. The event includes a presentation by an astronaut preceded by presentations from college students who have been funded by MASGC to work at NASA centers. The feedback from 2008 Space Day included the following comments from high school teachers who accompanied the students:

MASGC cosponsored teacher development workshops at the Perkins School for the Blind, to bring STEM and specifically aerospace-related information and material to visually handicapped students.

## OUTCOME 3

In order to provide informal education support resources that use NASA themes and content to enhance participant skills and proficiency in STEM disciplines, inform participants about STEM career opportunities and communicate information to the public about NASA’s mission, the consortium has developed a significant pool of qualified presenters of NASA aerospace content to interact with a large number of participants evidenced by MASGC’s assistance to obtain speakers and presenters for the NASA Future Forum in Boston last fall.

The consortium provided numerous opportunities to improve the competency and qualifications of STEM informal educators, enabling informal educators to effectively and accurately communicate information about NASA activities and access NASA data for programs and exhibits through Space Day and the Consortium’s

participation in the Massachusetts STEM Summit. To increase informal education development in the state the consortium partnered with the Boston Museum of Science (MOS) and the Christa McAuliffe Challenger Learning Center.

## PROGRAM ACCOMPLISHMENTS

### OUTCOME 1

- Support of 81 students from 12 academic affiliates across the state. Over half of these were female and minority students.
- Recruiting and supporting 14 students for summer internships at NASA centers and JPL.
- Supporting 3 students to attend conferences on space science held by the Students for the Exploration of Space (SEDS)
- Supporting 5 students to work on the Mars Gravity Biosatellite Project in which students from MIT and Georgia Institute of Technology are studying the effects of partial gravity on mice.
- Holding the “Modern Space Science and Engineering” seminar series open to all member institutions of MASGC. Over 30 students attended the seminars for academic credit or as auditors.
- Co-sponsoring 12-part STEM series at the Roxbury Community College, which was attended on the average by 20 minority students to expose them to various STEM disciplines including aerospace.
- Mount Holyoke College joined MASGC last year, becoming the second women-serving affiliate.

### OUTCOME 2

- Supporting teachers from the Kuss Middle School to attend scientific ballooning workshops
- Holding Space Day at the Boston Museum of Science, which was attended by 200 high school students.
- Supporting ballooning activities at the, Kuss Middle School in Fall River.
- The Director presented to the Perkins School for the Blind before students attended NASA’s space camp.
- The Co-Director worked with the Science Club for Girls, a program for inner city minority girls. As a result, the Club has 4 teams (a total of about 40 girls) enrolled in the NASA rocketry competition.

### OUTCOME 3

- Participating in the Massachusetts STEM Summit. The Co-Director serves on the planning committee for future summits.
- Organizing and conducting an Aerospace business roundtable in conjunction with the MA Office of Business Development, to assist the aerospace industry in the state. About 40 CEOs and presidents of companies in the state attended the roundtable. We expect that developing contacts with local industry will help MASGC with placement of student interns and research collaborations for our faculty.
- Partnering with NASA contractors and a number of aerospace companies to obtain industry internships for students in the summer. This is critical both for practical education for our students and for the workforce needs of the aerospace industry. MASGC advertises internship opportunities and helps recruit students. The Co-Director oversees the internships and makes visits to the industry partners during the summer to ensure that the students are having meaningful research experiences.
- Supporting the NASA Future Forum by helping arrange for speakers,, panelists, and student presenters, locally.

## PROGRAM CONTRIBUTIONS TO PART MEASURES

- Longitudinal Tracking: So far, most of our awardees are still in school. However, we have been tracking our students’ career plans to get an estimate of whether they have plans for research, education or employment in space-related areas. Of the 40 Space Grant students who have graduated, 8 are pursuing advanced STEM-related degrees, 3 are actively seeking STEM employment, 7 are employed by aerospace contractors, 3 are employed in non-aerospace STEM positions, 5 are employed by NASA or JPL, and 14 are working in STEM-related academic positions.
- Course Development: The consortium helped develop and provided speakers and funding for a 12 part STEM series at the Roxbury Community College which was attended on the average by 20 minority students to expose them to various STEM disciplines including aerospace.
- Matching Funds: Almost all of MASGC’s Higher Education and Research support takes the form of research fellowships. The total fellowship amount in our budget therefore significantly exceeded the

\$183,000 referred to in the guidelines as not requiring matching. The Consortium has received \$361,271 in matching funds so far (June through December 2008). We expect to receive at least \$287,350 over the remaining of our fiscal period ending in May 2009. It should be noted that for the last three years, non-federal matching funds for MASGC have exceeded our requirements by ~20%.

- **Minority-Serving Institutions:** Roxbury Community College is the state’s only designated “minority-serving institution”. Attracting community college students to space-related activities is challenging, because space is a field of endeavor most of the students have not thought about. Therefore, MASGC offered fellowships and a STEM seminar series to community college students, to encourage them to enter the aerospace workforce pipeline. It is, in effect, a "Scholarship for Service" program for the inner city minority population in Massachusetts. Holyoke Community College serves a large number of economically disadvantaged students.

**IMPROVEMENTS MADE IN THE PAST YEAR**

MASGC initiated a program of special summer internships for community college students. We funded an African-American female student from Roxbury Community College to spend the summer at MIT working in the Man Vehicle Laboratory’s Space Suit research project.

**PROGRAM PARTNERS AND ROLE IN PROJECT EXECUTION**

Currently, the Massachusetts Space Grant Consortium has 15 academic affiliates and 4 institutional (outreach) affiliates, covering the entire state from Cape Cod to the Berkshires. Members are listed below, together with the name of each affiliate’s representative to MASGC:

**Academic Affiliates**

Massachusetts Institute of Technology, Lead	Professor Jeffrey Hoffman
Amherst College (Amherst)	Professor George Greenstein*
Boston University (Boston)	Professor Supriya Chakrabarti
College of the Holy Cross (Worcester)	Professor Matthew Koss
Harvard University (Cambridge)	Professor Jonathan Grindlay
Holyoke Community College (Springfield)	Professor X.Ran Duan
Mount Holyoke College (South Hadley)	Professor Darby Dyar
Northeastern University (Boston)	Professor Al Sacco
Olin College (Needham)	Professor Steve Holt
Roxbury Community College (Boston)	Dr. Tala Khudairi
Tufts University (Medford)	Professors Marianne Vestergaard and Chris Rogers
University of Massachusetts (Amherst)	Professor Robert Hyers
Wellesley College (Wellesley)	Professor Richard French
Williams College (Williamstown)	Professor Jay Pasachoff
Worcester Polytechnic Institute (Worcester)	Professor Nikolaos Gatsonis

\*Professor Greenstein also represents the Five-College Astronomy Department, which in addition to Amherst, Mount Holyoke and UMass, also includes Hampshire and Smith Colleges. MASGC’s long-term goal is to make Hampshire and Smith full affiliate members in their own right, but this has not yet occurred.

**Institutional Affiliates (Outreach)**

Museum of Science (Boston)	Mr. Brian Rogan
Christa McAuliffe Center (Framingham)	Dr. Mary Liscombe
Marine Biology Laboratory (Woods Hole)	Dr. Michelle Bahr
Project Astro (Boston)	Ms. Cathy Clemens

The representative of each organization acts as a liaison for MASGC at their institution, which includes publicizing Space Grant activities and helping to screen and nominate students and programs for MASGC funding.