

Illinois Space Grant Consortium  
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[www.ae.illinois.edu/ISGC](http://www.ae.illinois.edu/ISGC)  
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## 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 Illinois Space Grant Consortium is a Designated Consortium funded at a level of \$575,000 for fiscal year 2011.

## PROGRAM GOALS

### **2011 ISGC Goals and Objectives**

- Diversity in Fellowship/Scholarship, Research Infrastructure and Higher Education program areas.
  - Reach the underrepresented minority percentage (currently 26.6%)
  - Reach the ISGC target of 40% for female awards
  
- Fellowships and scholarships
  - Provide scholarships and fellowships to students at ISGC academic institutions.
  - Increase the number of applicants for fellowships/scholarships to 140 in 2011
  - Ninety percent of scholarship recipients will enter graduate school or STEM employment at their "next educational step" (66% employment specifically at NASA, aerospace companies, universities or other educational institutions)
  
- Undergraduate research programs/assistantships in aerospace engineering and science
  - Increase the number of research opportunities for undergraduates by 50% in 2010
  - There will be six undergraduate research programs at ISGC academic institutions
  - Ninety percent of undergraduate research program participants will enter graduate school or STEM employment at their "next educational step" (66% employment specifically at NASA, aerospace companies, universities or other educational institutions).

- Seed grants
  - At least two out of the ten awardees will receive additional research funding
  - At least four of the grants will be awarded to women or underrepresented minorities
  - A community college will be involved with at least one of the seed grants
  
- External internships/Academies
  - At least three NASA Center summer interns from ISGC academic institutions will be supported during summer 2011
  - Will establish internship opportunities at *each* of its industrial/national lab partners
  - Number of internship programs at industrial/national laboratory partners will increase by 50%
  - Three students from ISGC institutions will be funded to attend the hands-on Connecticut Space Grant Helicopter Experience
  
- Educational activities outside of classroom
  - Support for at least five projects in a variety of areas: aeronautics, rocketry, and spacecraft
  - Students from Chicago-area community colleges will be recruited to apply for at least one of the projects
  
- Higher education STEM courses
  - Support at least four course development activities that expand the STEM knowledge
  - Support at least two new or revised course that incorporates hands-on activities
  - Support the development of a Systems Engineering curriculum
  - Two aerospace-related systems engineering courses will be developed and offered
  
- Teacher training
  - Offer standards-based teacher training in geographically diverse areas of the consortium
  
- Informal education
  - Offer two informal education programs in both Chicago and Rockford that will reach at least 100,000 individuals
  - At least one informal education program will focus on rural Illinois communities
  - At least one informal education program will involve collaboration with a community college

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

- Outcome 1: ISGC exceeded its target percentages for both the participation of women and the participation of underrepresented minorities in ISGC Scholarship/Fellowship, Research Infrastructure and Higher Education programs. Females – 46%; minorities – 28%.
- Outcome 1: The four research seed grants funded by base grant funds were awarded to two women and two underrepresented minority faculty. The faculty include Dr. Kim Coble at Chicago State University (“Investigating student understanding of cosmology”), Dr. D’Arcy Meyer-Dombard at UIC (“Deeply sources springs of the NAFZ”), Dr. Austin Harton at Chicago State (“Improving performance of solar cells using quantum dots”) and Dr. Jose

Garcia at the Illinois Institute of Technology (Tribological characterization of aerospace hydraulic pumps”), respectively.

- Outcome 1: ISGC hosted the October 2011 Great Midwestern Region Space Grant meeting on the UIUC campus. Thirty-two students from eight states participated in the poster competition.
- Outcome 1: ISGC provided funding for the development of an Aerospace Systems Engineering curriculum at the University of Illinois at Urbana-Champaign. ISGC supported a TA to work with the Coordinator; two new ASE courses were developed. In the 2011-2012 academic year, seven students enrolled in the courses and five will graduate May 2012. A team of five UIUC students was selected to participate in the NASA Reduced Gravity Education Flight Program: Systems Engineering Educational Discovery. They worked with Sherry Thaxton (Project PI) from NASA Johnson on “Human-Systems Integration of Tablet Computing in Microgravity.” Of the team, one member was female, one was Latino, and two were freshmen. When in Houston, the team also connected with UIUC alumni who are employed/contracted by NASA. Feedback from the alumni indicated that they were very impressed by the high quality of the students.
- Outcome 1: The number of students funded (and selected) to participate in NASA summer internships/Academies increased from 3 (2010) to 8 (2011).
- Outcome 1: ISGC agreed to participate in the first Great Midwestern Region Space Grant rocket competition. We expected that we would find enough interested students to assemble one team. Instead, four undergraduate student teams stepped forward; three teams were from UIUC and one team was from DePaul. All four were funded and participated in the competition on April 27 – 29, 2012. We are awaiting the results of the competition.
- Outcome 2: Dr. Vicky Kalogera of Northwestern University led a project to train 6<sup>th</sup> – 12<sup>th</sup> STEM teachers to incorporate computational thinking learning modules into their STEM classrooms.
- Outcome 3: Funding from ISGC enabled Adler Planetarium’s Astronomy Conversations program to increase attendance by 38% (a total of more than 35,000 participants.)

## PROGRAM ACCOMPLISHMENTS

### Outcome 1:

- *Diversity in Fellowship/Scholarship, Research Infrastructure and Higher Education program areas*
  - Direct participation by underrepresented minorities was 28%, exceeding the target of 26.6%.
  - Direct participation by females was 46%, exceeding the target of 40%.
- *Fellowships and scholarships*
  - Applications were received from all academic affiliates in ISGC.
  - Received 131 fellowship and scholarship applications, making the selection process very competitive. This is 9 short of our goal, but an increase of 1 over the number of 2010 applications.
- *Undergraduate research programs/assistantships in aerospace engineering and science*
  - Support was given to (6) undergraduate research programs at (5) ISGC academic institutions; one of the programs was targeted at underrepresented minority students.

- *Seed grants*
  - Four seed grants were awarded to junior faculty/researchers.
  - Four proposals based on the ISGC seed grant work have been submitted; three to NSF and one to NASA. So far, one has been funded.
  - All four of the grants were awarded to women or underrepresented minorities.
  - Harold Washington Community College, one of the City Colleges of Chicago was involved with Dr. Coble's research at CSU. The students at Harold Washington are primarily African-American.
- *External internships/Academies*
  - Seven students from ISGC academic institutions were supported to attend NASA Center Academies/internships (Goddard, Marshall and Ames). This is more than twice the number selected in 2010. Three of the students were female. A student selected by Dryden did not accept the offer.
  - Three students from Bradley University were selected for funding to attend the Connecticut Space Grant Helicopter Experience .
- *Educational activities outside of classroom*
  - Supported (4) hands-on projects: design/build fly remote control aircraft at UIUC; CubeSat at UIUC; USLI rocket team; and (4) teams (3 at UIUC and 1 at DePaul) to participate in Great Midwestern Regional Rocket Competition organized by the Wisconsin Space Grant.
  - Supported two students from community colleges who participated in the Reduced Gravity Student Flight Opportunities Program. Their team was formed through the NASA Community College Aerospace Scholars program.
  - Provided support for three Latino/a students to attend the Society of Hispanic Professional Engineers national conference.
- *Higher education STEM courses*
  - In alignment with NASA's interest in Systems Engineering, ISGC included in its 2010 goals a plan to support the development and implementation of a Systems Engineering curriculum at the master's level at UIUC. An Aerospace Systems Engineering (ASE) Coordinator was hired by the UIUC Dept. of Aerospace Engineering in May 2011. ISGC supported a TA to work with the Coordinator; two new ASE courses were developed. In the 2011-2012 academic year, seven students enrolled in the courses and five will graduate May 2012.
  - Also, under the auspices of ASE, a team of five UIUC students was selected to participate in the NASA Reduced Gravity Education Flight Program: Systems Engineering Educational Discovery. They worked with Sherry Thaxton (Project PI) from NASA Johnson on "Human-Systems Integration of Tablet Computing in Microgravity." Of the team, one member was female, one was Latino, and two were freshmen. ISGC supported the team's travel expenses.

## Outcome 2:

- *Teacher training*
  - Northwestern University offered a new program to train 6<sup>th</sup> – 12<sup>th</sup> grade STEM teachers to incorporate computational thinking learning modules into their STEM classrooms.

- ISGC continues its support of DePaul's Master of Science in Science Education (MSSE) degree program. Its seventh cohort of 14 Chicago Public School middle-school teachers began in 2011.
- The Discovery Center Museum in Rockford offered three teacher workshops; two were 4-day workshops and one was a 2-day workshop. A total of 62, K-12 teachers attended the three workshops. The workshops trained teachers on astronomy and rocketry, including activities to be used in the classroom and in afterschool programs.

### Outcome 3:

- *Informal education*
  - Two informal education programs were funded with ISGC 2011 base grant funds.
  - ISGC funding led to a 38% increase in participants in the Astronomy Conversations program at Adler Planetarium (more than 35,000 attendees total.) The funding paid for staff of additional sessions. The staff of grad students and post-docs included eight females and two minorities. A minority male undergraduate also worked with the program.
  - The Discovery Center Museum's YES program presented the *Outreach to Space* exhibits on four separate outreach visits in Boone County, Stephenson County and Winnebago County in Illinois. The *Outreach to Space* exhibition is not only designed to teach science concepts to families with children in rural areas, but to allow them to experience science. The exhibits help children and families learn about the concepts of outer space. There was a total of 2,850 attendees at the four events. Middle-school and high-school interns/volunteers help to staff the program. In 2011, there were six volunteers. YES volunteers gain valuable experiences in STEM disciplines, as well as education, public speaking, leadership and organizational skills.

### PROGRAM CONTRIBUTIONS TO PART MEASURES

- Student Data and Longitudinal Tracking: Total awards = 99; Fellowship/Scholarship = 27; Research Infrastructure (undergrad research programs and seed grants) = 58; Higher Education = 14. Of the students funded with 2011 base grant funds, 99% are still enrolled in current degree programs. The student who graduated in December 2011 has entered grad school in a STEM field.
- Diversity: ISGC exceeded its target percentages for both the participation of women and the participation of underrepresented minorities in ISGC Scholarship/Fellowship, Research Infrastructure and Higher Education programs. Females – 46%; minorities – 28%. Of the 14 PIs that were selected for project funding, 7 of them were female. ISGC consists of (1) lead institution (University of Illinois at Urbana-Champaign), (9) other academic institutions and (2) informal education institutions. Seven of the institutions are located in the Chicago area; the other five are scattered across the state; (1) in the northwest, (2) central, (1) west and (1) south. Five of the universities grant PhDs, the other five focus mainly on undergraduates, but do grant some master degrees. All affiliates were given the opportunity to submit proposals for funding.

- Minority-Serving Institutions: Chicago State University continues to be an active member of ISGC. In 2011, participation focused on research seed grants (including the participation of undergraduate researchers) and scholarships.
- NASA Education Priorities:
  - *Hands-on student experiences* – ISGC supported 58 students in six undergraduate research programs and four research seed grants. Seven ISGC students were selected for NASA intern/Academy research experiences and three for a hands-on helicopter workshop offered by the Connecticut Space Grant. ISGC funded four extracurricular projects at UIUC; design-build-fly radio-controlled aircraft, CubeSat, four teams in the Great Midwestern Region Space Grant rocket competition and a team participating in the USLI rocket competition. In addition, a team of students selected for a systems engineering research project sponsored by a PI at NASA Johnson, were funded for their travel to Houston.
  - *Middle school teacher training* – Three teacher programs were funded with base grant funds. Two of the programs involved a series of workshops that included middle school teachers. One of the programs focused on training teachers to incorporate computational thinking learning modules into their STEM classrooms. The other program provided training to teachers on astronomy and rocketry, including activities to be used in the classroom and in afterschool programs. The third program we continued to support was the Master of Science of Science Education (MSSE) degree at DePaul. MSSE includes both traditional coursework as well as NASA materials that will be used in the classroom.
  - *Community colleges* - Chicago State University continues to work with Harold Washington College (one of the City Colleges of Chicago) in astronomy education research. ISGC supported two students from community colleges who participated in the Reduced Gravity Student Flight Opportunities Program. Their team was formed through the NASA Community College Aerospace Scholars program.
  - *Aeronautics research* –Dr. Jose Garcia at IIT received ISGC seed grant funding for his research in “Tribological characterizations of aerospace hydraulic pumps for use with water as fluid.” Three undergraduate research projects at UIUC also were aeronautical related: “Investigation of ice accretion effects on a three-dimensional swept wing”, “Development of micro aerial vehicles” and “Analysis and computer simulations of designer materials and controls in aero-servo-viscoelasticity.”
  - *Research support for early career faculty* – ISGC continued to strongly support its research seed grant program for early career faculty and researchers at smaller institutions. Four faculty were selected for base grant funding. Each selected researcher receives \$10,000 to conduct research in areas of interest to NASA and gather data that will lead to a proposal(s) for further funding.

## IMPROVEMENTS MADE IN THE PAST YEAR

- ISGC exceeded its target percentages for both the participation of women and the participation of underrepresented minorities in ISGC Scholarship/Fellowship, Research Infrastructure and Higher Education programs. Females – 46%; minorities – 28%.

## PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

### *University of Illinois at Urbana-Champaign*

PhD-granting research university

Lead institution for ISGC

Public, land-grant institution

ISGC activities: management; undergraduate research; scholarships and fellowships; seed grants; course development; design/build/fly student projects

### *Illinois Institute of Technology*

PhD-granting research university

Private university

ISGC activities: undergraduate research; scholarships and fellowships; seed grants; course development

### *Northwestern University*

PhD-granting research university

Private university

ISGC activities: undergraduate research; scholarships and fellowships; seed grants; course development, teacher training

### *The University of Chicago*

PhD granting research university

Private university

ISGC activities: undergraduate research; scholarships and fellowships; seed grants;

### *Southern Illinois University Edwardsville*

Master's-granting university (professional degrees in medical fields)

Public institution

ISGC activities: seed grants; scholarships and fellowships; course development

### *University of Illinois at Chicago*

PhD granting research university

Public institution

ISGC activities: undergraduate research; scholarships and fellowships; seed grants

### *DePaul University, Chicago*

Master's granting university

Private institution

Eighth-largest private, not-for-profit university in the nation

ISGC activities: scholarships; K-12 teacher training; undergraduate research; seed grants

### *Bradley University, Peoria*

Master's granting university (one PhD program)

Private Institution

ISGC activities: scholarships; seed grants; K-12 teacher training

*Chicago State University, Chicago*

Master's granting university

Public institution

Recognized as a Minority Serving Institution

ISGC activities: undergraduate research; scholarships; seed grants; course development

*Western Illinois University, Macomb* (will focus on reactivation in 2012)

Master's granting university

Public institution

ISGC activities: K-12 teacher training; scholarships

*Adler Planetarium & Astronomy Museum, Chicago*

Planetarium, education and research institution

Not-for-profit

ISGC activities: seed grants; K-12 teacher training; higher education programs; informal education programs

*Discovery Center Museum, Rockford*

Educational and recreational institution

Not-for-profit

ISGC activities: K-12 teacher training; informal education programs