

Iowa Space Grant Consortium  
University of Northern Iowa  
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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 fellowship and scholarship 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 Iowa Space Grant Consortium is a Designated Consortium funded at a level of \$845,000 for fiscal year 2010.

## PROGRAM GOALS

***Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals: (Employ and Educate).***

GOAL 1 – Award and administer competitive fellowships and scholarships for higher education that offer student research and educational opportunities in the STEM fields that align with NASA's mission.

GOAL 2 – Implement a scholarship program for a minority-serving institution (MSI) that is linked with the base program at one or more academic affiliates.

GOAL 3 – Provide a new scholarship program for community college students engaged in STEM fields to promote retention of students in STEM-related fields.

GOAL 4 – Continue to implement a scholarship program for outstanding seniors at the State Science and Technology Fair of Iowa (SSTFI) that has a positive impact on the retention of students in STEM.

GOAL 5 – Promote and support interdisciplinary research activities to faculty and other affiliate members that develop innovative technologies, knowledge, and infrastructures to advance NASA's mission.

GOAL 6 - Develop competitive, self-sustaining base programs at each academic affiliate campus that provide faculty and students with authentic hands-on, NASA-related, mission-based research and development (R &D) and education activities.

GOAL 7 – Create a new initiative to fund interdisciplinary research (IR) incubation grants to early-career faculty at academic affiliates in fields aligned with NASA's mission.

***Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty: (Educate and Engage).***

GOAL 8 – Support and conduct statewide STEM professional development, preservice and inservice training for formal and non-formal educators working in K-12 that use NASA content.  
GOAL 9 – Engage more precollege organizations in the statewide Partner Schools program.  
GOAL 10 – Promote and provide hands-on NASA-related activities particularly to minority and underserved students, and schools for the disabled in Iowa.  
GOAL 11 – Leverage existing programs such as National Junior Academy of Science to promote NASA-related activities in Iowa.

***Outcome 3: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA’s mission: (Engage and Inspire).***

GOAL 12 – Support STEM informal educational programs that enhance public awareness of NASA missions and general scientific literacy for Iowa.

GOAL 13 – Publicize NASA-related education, research, and outreach activities to citizens of Iowa.

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

***Outcome 1:*** The ISGC has awarded 35 fellowships and scholarships to undergraduate and graduate students at higher education institutions. Augmentation funding received by the consortium in 2010 allowed us to award the highest number of grants in our history. Of these fellowships, we would particularly like to highlight six new community college student fellowships in Iowa as well as three precollege scholarships to qualified students at the SSTFI. All the fellowship and scholarship programs are competitively awarded and support women, underrepresented minorities, and persons with disabilities. Four awards were to underrepresented minorities, and 17 were to women. The following anecdotal messages clearly demonstrate the benefit of ISGC funding for students.

*Working with the Operator Performance Laboratory (OPL) and with NASA has been an unbelievable experience and the opportunity of a lifetime. The work is interesting as we are able to start a project from the ground floor and unlike many jobs across the country, we get to work with it to completion. It is about the details and seeing a project through to the end. I love working with our contractors, I have met some wonderful people and cannot thank NASA and the University of Iowa enough for the opportunity to work with them. Through this work, I have started to shape the skills that will accompany me throughout life and as I progress in my career. I know the experience has been invaluable. --Nicholas Anderson FY2010 undergraduate community college recipient, University of Iowa*

*As an ISGC scholarship awardee, I have had the opportunity to become connected with researchers at Iowa State University exploring methods for sustaining life in controlled environment systems. I am currently working with a research team in the Food Science and Human Nutrition department. We are examining the benefits of algae for water and air remediation. With mentoring from my research team, I am currently developing a procedure that will test how algae perform at remediating wastewater by adjusting flow rates. I anticipate my discoveries to be relevant to NASA as a possible means for keeping*

*water clean in such a resource limited environment as space.-- Celia Clause, FY2010 undergraduate recipient, Iowa State University*

*The NASA Iowa Space Grant Consortium (ISGC) has made a resounding impact on my future goals. Through this program, I have had the opportunity to work on original research that would not have been available to me without the ISGC. This year, I have started to tackle larger, more involved projects such as determining the potential environmental impact on Iowa cropland when farmers skip corn-soybean rotations. Through this project, I have actually gotten to work with Michael Bosilovich, a NASA employee in the Global Modeling and Assimilation Office, who helped me understand and maneuver MERRA (a model for global climate). Wherever my career path and education leads me, I know I have a solid foundation in research techniques, a desire to learn more, and the skills to succeed because of the NASA Iowa Space Grant Consortium.*  
-- Susan Meerdink, FY2010 undergraduate recipient, University of Northern Iowa

*Receiving the NASA Iowa Space Grant Consortium (ISGC) scholarship and fellowship has strengthened my relationship with the ISGC's Drake program. This has given me access to more extensive research opportunities and experiences. For example, last semester I actively participated in a study that evaluated the self-application of the SWAT-T tourniquet to assess its potential use by the U.S. Army. The technique has substantial clinical potential because it may prevent edema and further complications of traumatic injuries. This skill, among others I have gained from researching at Drake, will aid me in my pursuit to become a physician-scientist.* Josie Pokorny, FY2010 undergraduate recipient, Drake University

Five grants were awarded to faculty at the university level to conduct interdisciplinary research. With Augmentation funding, we initiated a new program to fund interdisciplinary research (IR) incubation grants to early-career faculty at academic affiliates. One winner was selected based on the statewide competition. The research infrastructure grants enabled Iowa researchers to build connections with several NASA scientists. Dr. Wie, one of the awardees, noted in his report, “*Due to the successful progress of the ISGC research project, I was invited for a lecture at NASA’s Goddard Space Flight Center as well as at NASA headquarters in October 2010.*” Dr. Amy Kaleita, another awardee from Iowa State University, said, “*The ISGC base program funding has given me the opportunity to build my networking skills, and allowed me to develop collaborations with scientists I may not have had access to without the funding for travel and visits. It has also allowed me to establish new research lines into medium-risk areas where grant funding was unlikely without preliminary results, which I now have.*”

Gregory Neiswander, a graduate student and previous scholarship and fellowship awardee has just won the 2011 American Helicopter Society (AHS) National Lichten Award. This is a national competition for new technical authors and his thesis work (Improving Rotorcraft Deceleration Guidance for Brownout Landing) will be presented at the AHS conference in Virginia Beach in May 2011. Over a four-year timeframe of our funding, Greg worked with the Operator Performance Laboratory during his undergraduate and masters studies and was previously reported as having reached his next step in our longitudinal tracking system. He is currently working at the Aeroflightdynamics Directorate (AFDD) at Ames Research Center.

**Outcome 2:** The consortium’s precollege program, E-SET, partnered with other entities within Iowa that are also focused on attracting and retaining students in STEM disciplines through providing professional development. Although some student programs were delivered, the program’s focus is “train the trainer,” with an emphasis on increasing educator awareness of NASA and the support provided for STEM education. The ISGC Partner School program continued to provide professional development in cooperation with NASA Centers. Teacher impact continues to be strong, as measured by implementation of NASA-related learning experiences within the classroom as well as professional development provided by partners for colleagues back in Iowa. The impact of the connection made by the teachers who participate in the partner program is given voice by partners who attended the 2011 SEEC (teachers currently working with an ISGC pilot program to reach underserved and female students):

*“Amy has been soaking it all in like a sponge. We said we each needed to get one really good activity to use with the girls. We each have a dozen or so now. I hope things are going well for you also! Thank you for this opportunity!”*

*“One of the ‘bonuses’ of being involved with the Iowa Space Grant Consortium (which gladly helps support our girls!) is the funded trip to Johnson Space Center in Houston for the 17<sup>th</sup> annual SEEC (Space Exploration Educators Conference). I was in awe over the classes I could choose to take part in. I wanted to take classes that would help my students learn more about science and space, but also awaken their curiosity. I chose classes about digital storytelling, how to ‘take’ my school to space for a week, what microgravity was all about, and many more! As I sit here writing this, I keep thinking about all the ways to incorporate what I learned into not only science class and the girls’ club, but also in the other subjects in school.”*

**Outcome 3:** The consortium provided numerous opportunities to improve the competency and qualifications of STEM informal education in Iowa. In 2010, the ISGC competitively selected five high-quality proposals from its affiliates to conduct effective informal education projects in Iowa.

*“ISGC funds have allowed us to provide new assessments and take-aways for our Putnamology program. Putnamology is a hands-on science workshop for students age ten and up with an adult caregiver that is offered in partnership with area businesses.”*

## **PROGRAM ACCOMPLISHMENTS:**

### ***Outcome 1:***

- Thirty-five student scholarships and fellowships were supported from all four academic affiliates across the state, all higher education institutions.
- In 2010–11, the ISGC initiated and funded six new community college scholarships to attract and retain students in STEM fields.
- The ISGC implemented a scholarship program for outstanding seniors at the State Science and Technology Fair of Iowa (SSTFI) that has a positive impact on the retention of students in STEM. Three awards were given this year.
- A scholarship program was supported for a minority-serving institution (MSI) linked with the base program at academic affiliates. This year, four students from Nebraska Indian

Community College (NICC) received training and scholarships at the University of Northern Iowa as continuing education enrolled students.

- The ISGC ran a new statewide competition and selected a winner for the early career award, Dr. Wen from Iowa State University (ISU). His research topic is entitled “*Developing a Novel Algal Culture as a Life Support System under Microgravity Conditions.*” The goal of the project is to develop a sustainable life support system that can remove carbon dioxide while replenishing oxygen and potable water. Dr. Wen and his associates are proposing to use a novel algal culture system to achieve this goal. He has already developed connections with the NASA Goddard Space Flight Center and is planning to visit this summer for testing the algal species developed there.
- The ISGC continues to support the Asteroid Deflection Research program, which will be graduating next year. This program has supported several students and produced a number of publications.
- More than 15 faculty members have been supported for interdisciplinary research activities at different academic affiliates.
- More than 20 graduate and undergraduate students were supported in their research work at various base programs.
- Iowa researchers established ten new scientific collaborations with researchers from different NASA Centers in the country. Other collaborations of Iowa researchers include more than ten federal agencies, four industries, and several other academic institutions in Iowa.
- A new base program was competitively selected at Drake University.
- A new base program selection for Iowa State University is underway.

***Outcome 2:***

- Professional development for 16 inservice teachers and one preservice teacher was provided through the ISGC Partner School program.
- Partners from the previous and current program years conducted workshops within Iowa for colleagues.
- A new pilot program has reached 14 middle school girls with a long-term on-going science club: six Hispanic, four Native American and four Caucasian.
- Partner teachers presented NASA programming at the Iowa Science Teachers fall conference in October, made presentations of how to include NASA in classrooms at a Department of Education workshop in Iowa, and presented to school colleagues.
- Two teachers presented at a workshop and reached 73 teachers and seven administrators with NASA programming.
- Twelve teachers joined ISGC for professional development at KSC in July, two attended the Space Exploration Educators Conference in February, and four teachers plus one preservice teacher attended the NSTA to participate in the large NASA education presence this year.
- ISGC has conducted short-term professional development that has reached 1,841 teachers, parents, and administrators with STEM focus.
- ISGC has conducted long-term (at least 32 hours) professional development in partnership with a Department of Education Institute of Education Sciences (IES) grant for 234 teachers and administrators or as part of the Partner School program.
- ISGC has reached 278 youth with direct programming.

- Partners engaged to assist in reaching youth have been quite positive. A partner from a robotics challenge conducted for middle school students said,  
*“This program is developing the future leaders for our industry.”*  
 And a parent of one of the youth commented,  
*“Ironically, some of the best things they learn have nothing to do with robotics. They really aren’t a team at the beginning, but it’s amazing to watch the transformation. They learn to communicate and listen to each other’s ideas, and they have so much fun together that sometimes they even forget what they are doing.”*

**Outcome 3:**

- Five STEM non-formal educational programs were supported that enhance public awareness of NASA missions and general scientific literacy for Iowa.
- The ISGC is co-sponsoring the Second Annual Academic High Altitude Conference (high altitude balloons) to be held at Iowa State University on June 20-24, 2011 (<http://www.sscl.iastate.edu/conference/>).
- A balloon workshop was organized by one of the outreach affiliates in Waterloo, Ia and held on March 5-6, 2011.
- A new Website was designed to give researchers and educators a place to go for help with NASA programs (<http://www.iaspacegrant.org/>).

**PROGRAM CONTRIBUTIONS TO PART MEASURES**

- Longitudinal Tracking:
  - Total new significant awards = 30; Fellowship/Scholarship = 25, Higher Education = 4, Research Infrastructure = 1; four of the total awards were to underrepresented minorities (13.3%); and 14 of the total awards were to women (46.7%).
  - All FY2010 students remain enrolled in their current STEM degree programs with 11 set to graduate in spring 2011 semester.
  - Of the FY2006-09 awardees in our tracking system, 35 students are still enrolled in their current STEM degree program, two have graduated and are pursuing an advanced STEM degrees, and one has taken the next step and is employed in STEM by an aerospace contractor. Four of these students are classified as underrepresented minorities, and six are women.
  - We have successfully exceeded our annual target, per the education table data for 2007, of 10.77% for underrepresented students, as well as the NASA goal of 40% women.
- Course development: Though previously supported, the consortium did not directly support any course development this year.
- Matching funds: The ISGC requires 1:1 match to all Space Grant funds awarded for research.
- Minority-serving institutions: As there are no minority-serving institutions in Iowa, the ISGC established a program with the Nebraska Indian Community College (NICC) to allow students to compete for scholarships to attend a geospatial workshop at UNI and to complete a research project at their institution. The second workshop was a week long session, held August 3-6, 2010. Four students received scholarships and were invited to UNI for an advanced GIS workshop. As three of the students had received training before, more advanced topics were covered such as spatial analysis, GIS modeling, and remote sensing and image classification. On February 4, 2011, the workshop coordinator revisited NICC to

talk with the students about their projects. One more trip is planned in mid-April for final project presentation.

## IMPROVEMENTS MADE IN THE PAST YEAR

- ISGC initiated a new fellowship and scholarship program for community college students.
- A new initiative has been created to fund interdisciplinary research (IR) incubation grants to early-career faculty at academic affiliates in fields aligned with NASA's mission.
- Hands-on NASA-related activities have been promoted and provided to minority and underserved students, and schools for the disabled in Iowa.
- A new website was designed to give researchers and educators a place to go for help with NASA programs (<http://www.iaspacegrant.org/>).

## PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

The participation of partners varies as research topics and themes change from year-to-year. Specific involvement in the current program year is listed in italics below.

1. Ames Laboratory of the U.S. Department of Energy (federal lab)
2. Drake University (private four-year university) - *Executive Committee member, base program management, scholarship and fellowship selections*
3. Grout Museum District (science museum) - *Informal education competition winner*
4. Iowa Academy of Science (nonprofit organization) - *Iowa Junior Academy of Science poster competition*
5. Iowa Aviation Promotion Group (nonprofit organization) - *Informal education competition participant*
6. Iowa Department of Education (state government) - *Partner Schools program, State Science and Technology Fair of Iowa*
7. Iowa Department of Natural Resources (state government)
8. Iowa Department of Transportation - Office of Aviation (state government)
9. Iowa State University (public Ph.D.-granting university) - *Executive Committee member, base program management, scholarship and fellowship selections, research infrastructure project continuation, early career investigator research program competition winner*
10. National Mississippi River Museum and Aquarium (science museum) - *Informal education competition winner*
11. National Lab for Agriculture & the Environment (federal lab)
12. National Mississippi River Museum & Aquarium (science museum) - *Informal education competition winner*
13. Putnam Museum & IMAX Theatre (science museum) - *Informal education competition winner*
14. Rockwell Collins (industry)
15. Science Center of Iowa (science museum) - *Informal education competition winner*
16. Science Station (science museum) - *Informal education competition winner*
17. Softronics Limited (industry)
18. University of Iowa (public Ph.D.-granting university) - *Executive Committee member, base program management, scholarship and fellowship selections*
19. University of Northern Iowa (public master's-granting university) *Lead institution - Executive Committee member, base program management, scholarship and fellowship selections, minority- serving institution workshop site*