Pennsylvania Space Grant Consortium
Lead Institution: The Pennsylvania State University
Director: Christopher H. House
Telephone Number: 814-865-8802
Consortium URL: http://pa.spacegrant.org
Grant Number: NNX15AK06H
LOB: 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 Pennsylvania Space Grant Consortium is a Designated Consortium funded at a level of $760,000 for fiscal year 2017.

B. PROGRAM GOALS

(1) Develop and promote opportunities for undergraduate and graduate students to participate in research and discovery, including space-related student engineering projects; include programs that enhance the participation of students from underrepresented groups. (2) Provide graduate and undergraduate training in NASA-related fields through the mechanism of fellowship and scholarship awards; increase the number of awards to students from underrepresented groups. (3) Implement programs targeted at increasing the retention rate of students from underrepresented groups in science and engineering. (4) Provide information and programs to increase access to the excitement, knowledge, and technology from America’s earth, air, and space programs; establish PSGC as a viable state resource and catalyst for aerospace research, education, and economic development. (5) Cultivate a statewide network of partners from universities, industry, science centers to pursue aerospace research, education, and economic development goals.
C. PROGRAM/PROJECT BENEFITS TO PROGRAM AREAS

- **NASA Internships, Fellowships and Scholarships (NIFS):** In FY2017, Sofia Tieze, a Biology major at Haverford College, participated in a summer internship at NASA Ames Research Center funded by the PSGC. From this opportunity, Sofia was invited to submit an abstract and attend the 33rd Annual Meeting American Society for Gravitational and Space Research were she presented her summer research work.

- **Higher Education:** In FY2017, students working in the Student Space Programs Lab (SSPL), funded by PSGC, designed and built the OSIRIS-3U satellite. The satellite launched in August 2017 and when in orbit it will provide measurements of the heated ionosphere to better understand space weather phenomena. In FY2017, an engineering team of the PSGC sponsored Drexel Space Systems Laboratory, competed in NASA’s Revolutionary Aerospace Systems Concepts Academic Linkage forum and took first place in the category of best in theme with their airlock design “Modular Multi-Mission Airlock.”

- **Pre College:** In FY2017, the PSGC supported the Spring Grove Area High Rocketry Team as they competed in the NASA Student Launch Initiative. The team successfully flew their high powered rocket from the Marshall Space Flight Center in Huntsville, Alabama. Two team members are now going to pursue degrees in aerospace engineering.

D. PROGRAM ACCOMPLISHMENTS

- **NASA Internships, Fellowships, and Scholarships:** In FY2017, we supported 13 students to participate in NASA center internships around the country. We made a strong effort to offer internship funding to students from underrepresented groups with the percentage at 46% women awardees and 15% underrepresented minorities. Additionally, we supported 6 students with summer internships to participate in the Lunar Lion spacecraft project (16% female, 16% underrepresented minorities).

  In FY2017 we awarded 30 Pennsylvania Space Grant Graduate Fellowships, of which 53% were awarded to women and 20% to underrepresented minorities. Seventeen recipients state-wide were awarded the Pennsylvania Space Grant Undergraduate Scholarship (59% female, 18% underrepresented minorities). Additionally, 35 scholarships were awarded at our affiliate institutions (40% female, 29% underrepresented minorities). In terms of our specific targets for our fellowship and scholarship programs, we exceed our specific goal of 50 awards state-wide.
We had a total of 119 students participate in our WISER/MURE/FURP undergraduate research scholarship program this fiscal year. Of the scholarships awarded, 86% were granted to females and 24% were granted to underrepresented minority groups. We exceeded our metric of 62 participants this fiscal year. Additionally, we exceeded our metric of 60% female participants and 20% underrepresented participants.

• **Higher Education projects:** In FY2017, the PSGC supported three teams (Gannon University, Temple University and University of Pittsburgh) to participate in the 2017 Solar Eclipse High Altitude Ballooning project. These three projects engaged 21 undergraduate students (43% female). The team from Gannon University successfully developed a multi-camera streaming payload to all 360 degree of viewing angles. The team traveled to Kentucky to capture the eclipse at the longest duration of 2 minutes and 30 seconds. The team from Temple University developed a camera that the ground crew can operate, maintaining focus on the eclipse with a steady shot. This was accomplished using a raspberry pi microchip. Their innovative model received attention from their peer groups through the NASA newsletter. The team from University of Pittsburgh traveled to Tennessee to launch high-altitude balloons from across the path of totality to study the eclipse and, for the first time ever, stream photos and live video from near-space. In terms of our specific targets for our higher education programs, we exceeded our target with 41 students in the ACURA program, providing hands-on research and creative discovery for Penn State Abington undergraduate students, resulting in 46% female participation. At Franklin & Marshall College and Gettysburg College, the NURO program engaged 7 students involved in undergraduate research. The PSGC supported higher education student space hardware programs, including Penn State Students Systems Laboratory, Penn State Flight Vehicle Design and Fabrication course, Temple University Student Space Exploration and Embedded Systems Laboratory and Drexel University Space Systems Laboratory greatly surpassed the overall student involvement targets with participation numbers totaling more than 167 participants.

We exceeded our metric of state-wide higher education seed grant awards by funding University of Pennsylvania, Washington & Jefferson College, and Wilkes University. Additionally we exceeded our metric of two consortium mini grants by awarding four mini grants to the following institutions in support of their higher education student engagement: Gannon University, Lehigh University, Gettysburg University, and Franklin & Marshall College

**Research Infrastructure projects:** In FY2017, we met our goal by supporting a new project at Lafayette College by junior faculty member Rachel Koh. She works on sustainability in mechanical engineering. Her research focuses on how to make useful products with sustainable materials. In FY2017, we provided bridge support for a finishing Ph.D. graduate student to help her complete her degree, draft papers, while preparing to transition to a postdoctoral position at a National Laboratory.
• **Precollege projects:** Precollege programming supported a total of 2,545 students and 58 educators. We exceeded our specific target of funding one new precollege program by supporting the University of Pennsylvania Life Sciences Professional Development for Philadelphia Teachers Sessions, Corpus Christi School Educator, Amanda Blough, to attend the Space Academy for Educators, and Baldwin-Whitehall School District Integrated Science Teacher, Deborah Reynolds to attend the Liftoff Summer Institute, a weeklong professional development training for precollege educators. We contributed to travel expenses, fees, as well as funding the purchase of materials and supplies in order to give underserved school districts the opportunity to participate in hands on science lessons to add to the current curriculum, bring a real world activities to the classroom, and ideas on how to increase student engagement and interest in the STEM field through exploration and discovery.

Additionally we collaborated with the Penn State In-service Workshops in Astronomy in support of 18 middle and high-school science teachers to participate in a week-long workshop in modern astronomy. We assisted these teachers by supporting them in earning graduate credit for their participation in the professional development workshops.

• **Informal Education projects:** In FY2017, PSGC student led Lunar Lion team participated in the annual Bellefonte Science night hosted by the Penn State Office of Science Outreach. This activity promotes community and family support of STEM education in local schools, interacting with 500 elementary, middle and high schools this year. Additionally, our graduate fellowship recipients participated in 300 hours of educational outreach or mentoring during FY2017 through various community activities to engage and inspire.

**E. PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE GOALS**

• **Diversity:**

Fellowships and Scholarships = 45 students received awards from underrepresented minority groups out of 187 participants (24%); and 113 female students received awards (60%). We exceeded our metric of awarding 17% of PSGC fellowships and scholarships to underrepresented minorities. Included in this summary, are two historically black colleges and universities, Lincoln University and Cheyney University. Both of these schools offer PSGC scholarships to deserving students so that the student can gain valuable, authentic research experience at their home institution. Lincoln University awarded two scholarships (100% female) and Cheyney University awarded one scholarship. Also, included in this summary, is support offered to Penn State University Eberly College of Science Underrepresented Minority Summer Research Experience. In FY2017, this program awarded five such summer scholarships (60% female).
In all programming combined (FS, HE, & RI) = 68 students received awards from underrepresented minority groups out of 414 participants (16%); and 295 female students received awards out of 414 participants (71%). We approached our metric of 17% of awards to underrepresented minorities.

Additionally, a high number of our participants come from underserved rural populations throughout Pennsylvania.

- **Office of Education Annual Performance Indicators:**
  - API ED-17-1 191
  - API ED-17-2 58
  - API ED-17-4 22
  - API ED-17-5 2,545

**F. IMPROVEMENTS MADE IN THE PAST YEAR**
In FY2017, we rolled out a marketing strategy to in an effort to increase the number of statewide schools engaged in order to increase our applicant pool. As a result, in FY2017 we had a highly competitive pool and awarded four times the awards than issued in the previous fiscal year. Additionally, we reached three higher education institutions that had not received prior scholarship support from our Consortium.

**G. CURRENT AND PROJECTED CHALLENGES**
Pennsylvania has many accredited colleges and universities that are eligible to apply for our higher education mini grant program. This program is designed to provide funding for these institutions in support of continuing, expanding or developing new STEM programming. In the upcoming year we would like to work on a marketing strategy to increase engagement with these state-wide institutions. As a result our goal is to increase our higher education seed grant application pool.

**H. PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION**
- **The Pennsylvania State University:** Lead institution; 4-year University. Manages undergraduate and graduate student scholarships and fellowships, undergraduate research programs, K-12 educator professional development workshops, public outreach events, and hosts three unique space systems laboratories and flight courses; mini grant recipient.
- **California University of Pennsylvania:** Affiliate; 4-year university. Manages atmospheric sciences/remote sensing research group.
- **Carnegie Mellon University:** Affiliate; 4-year university. Manages “Go Research!” summer undergraduate research program; involved in Lunar Lion X-Prize team internship.
- **Cheyney University (MSI)**: Affiliate; 4-year university. Manages undergraduate scholarship program.
- **Drexel University**: Affiliate; 4-year university. Operates Drexel Space Systems Laboratory.
- **Franklin & Marshall College**: Affiliate; 4-year university. Manages the NURO undergraduate research in astronomy program.
- **Gannon University**: Affiliate; 4-year university. Operates Gannon University High-altitude Balloon Program.
- **Gettysburg College**: Affiliate; 4-year university. Manages the NURO undergraduate research in astronomy program.
- **Lehigh University**: Affiliate; 4-year university. Manages undergraduate and graduate student and NASA explorers schools project; mini grant recipient for the hopper spacecraft simulator project.
- **Lincoln University of Pennsylvania (MSI)**: Affiliate; 4-year university. Administers undergraduate student scholarship.
- **Montgomery County Community College**: Affiliate; community college. Involved in projects and activities in collaboration with the Temple University Space Systems Laboratory.
- **NASTAR Center**: Affiliate; industry. Manages STEM education programs for students and teachers.
- **Penn State University – Abington**: Affiliate; 4-year university. Manages undergraduate research program, ACURA; facilitates radio astronomy investigations program at the National Radio Observatory.
- **Temple University**: Affiliate; 4-year university. Manages the Student Space Exploration and Embedded Systems Laboratory, summer program in electrical engineering for high school students, and undergraduate scholarship program.
- **University of Pittsburgh**: Affiliate; 4-year university. Manages NASA Space Grant fellowship program for undergraduate students; Education Resource Center elementary and middle school GLOBE program.
- **West Chester University**: Affiliate; 4-year university. Manages the undergraduate research program to increase numbers in STEM majors.
- **Academic STEM Alliance (Bald Eagle, Bellefonte, Penns Valley Area School Districts)**: Program partner; K-12 school district. Involved in Centre County pre-college and informal education programs.
- **The Aerospace Corporation, Ball Aerospace, Boeing, and Lockheed Martin**: Industry partners. Involved in Penn State student projects.
- **Center for Science and the Schools**: STEM education network member. Involved in educator professional development workshops at Penn State University.
- **The Franklin Institute**: Program partner; museum. Involved in activities related to the Drexel Space Systems Laboratory.
- **Lafayette College**: Mini grant recipient; provides research and educational opportunities to undergraduate students in STEM education.

• **National Radio Astronomy Observatory**: Program partner; government facility. Hosts undergraduate research in astronomy for Penn State Abington teams.

• **Penn State Public Broadcasting**: STEM public outreach partner. Involved in marketing and outreach for informal education events and programs.

• **Philadelphia Area School District**: Program partner; K-12 school district. Involved in Temple University Space Systems Laboratory projects.

• **University of Pennsylvania**: Mini grant recipient; provides research opportunities to undergraduate students in the university aerospace community.

• **Wilkes University**: Mini grant recipient; provides research and educational opportunities to both faculty and undergraduate students in STEM education.