

# NASA PENNSYLVANIA SPACE GRANT CONSORTIUM

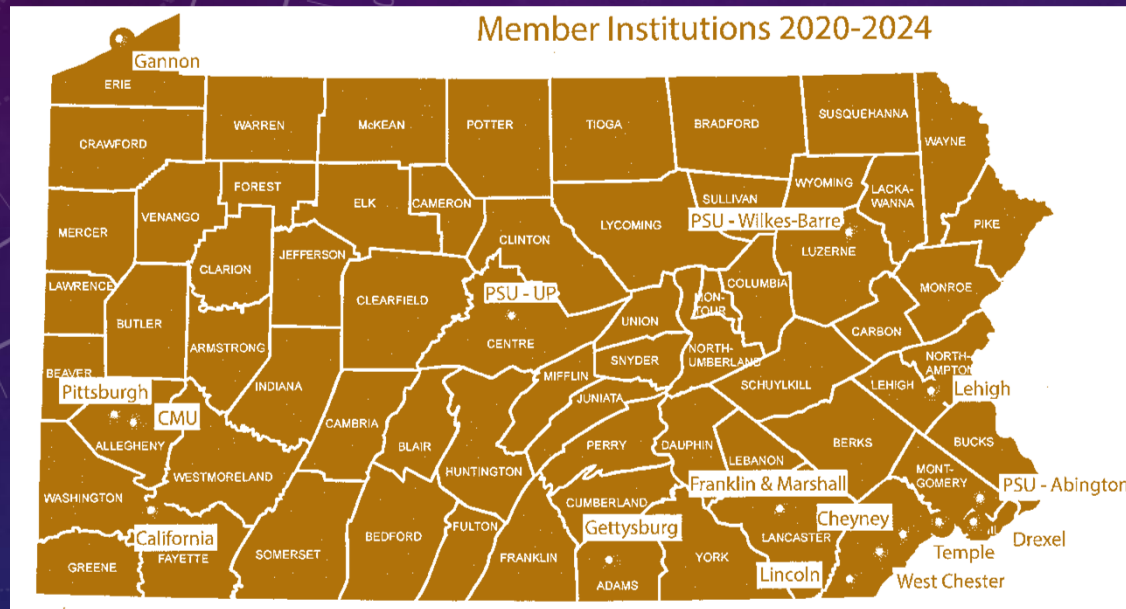


## PSGC Undergraduate Research: From First-Year to Capstone Projects



Carol Kearney High  
PSGC Grants/Operations Manager  
Mid-Atlantic Regional NASA Space Grant Consortia Meeting

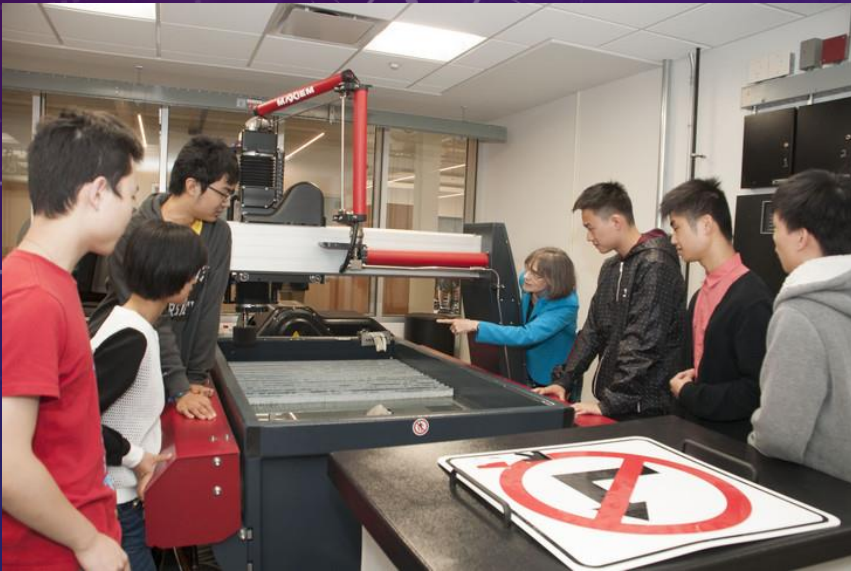
Pennsylvania Space Grant Consortium (PSGC) programs and projects are designed to suit the strengths of individual institutions and serve the needs of the Commonwealth.



California University of PA - Carnegie Mellon University - Cheyney University of PA -  
Drexel University - Franklin & Marshall College - Gannon University -  
Gettysburg College - Lehigh University - Lincoln University -  
Abington College, University Park, Wilkes-Barre campuses of Penn State University -  
Temple University - University of Pittsburgh - West Chester University of PA



PSGC programming emphasizes support for NASA-relevant undergraduate student research and hands-on discovery, including space-related student engineering projects, through fellowships, internships, and other competitive award programs.



*Dr. Ann Schmiedekamp (physics) of PSU - Abington College, demonstrates equipment to students. During the past year, undergraduate students studied the quality of data from Green Bank and Arecibo telescopes.*



*Temple University student Tashia Myrick wires a microcontroller to the propulsion fans on her hovercraft during her first year in college.*



*Over the past 11 years, via PSGC funds and matching Temple University funds, an “umbrella student laboratory” - the Space Exploration and Embedded System Lab (SSEESL) - was created, in which both graduate and undergraduates work together with faculty on space environment experiments.*

For several years Dr. John Helferty has led student Temple University teams in a RockSat-C program, assisting them through the design phase in the fall semester and leading the teams through testing and integration reviews in the spring.

Many students who experienced the Space Exploration and Embedded System Lab (SSEESL) now work both within NASA and in the general aerospace industry.

In 2018 three were employed in the aerospace industry: Sean Martin at Johns Hopkins Applied Research Lab working on the Lucy mission to Jupiter; Reith Nolan at Southwest Research Institute also working on the Lucy mission to Jupiter; and Dave Arnott at BAE Systems in North New Jersey.



Over the past 10 years, PSGC support has helped Gannon University offer opportunities for undergraduate students to gain hands-on research and engineering experience on authentic flight platforms as students constructed various payloads for high-altitude ballooning.

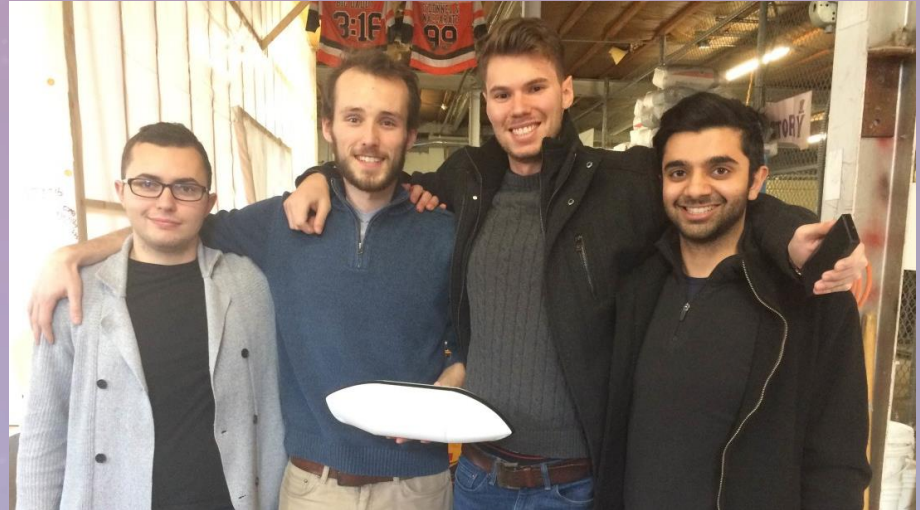
Building their own payloads for experiments not only provides undergraduate students with opportunities to engage in Earth science-bound research via high-altitude ballooning but also leads to better understanding the causes and consequences of climate change and other global environmental concerns.



*Under the direction of Dr. Wookwon Lee (electrical and computer engineering), Gannon University has developed a complete ballooning system consisting of several payloads, one fixed ground station, and two mobile ground stations.*

Drexel University's Space Systems Laboratory (DSSL) was established in 2009 to inspire future generation of students to advance aerospace technology. Led by Dr. Ajmal Yousuff, its mission is to provide the three Es: Experience (through hands-on and theoretical projects), Excitement (by observing completed projects fly), and Exposure (participation in conferences and competitions).

Student involvement in these projects is coordinated with Drexel's STAR program (selected from first-year students typically with GPA of 3.5 or higher), First-year Design (selected from all engineering first-year students), and Senior Design Programs (selected from all engineering senior students).



*Under the direction of Dr. Ajmal Yousuff (mechanical engineering and mechanics), one Drexel team performed well in Elon Musk's SpaceX Hyperloop Pod Competition.*

Members of DSSL have been participating in NASA's RASC-AL (Revolutionary Aerospace Concepts - Academic League) Competition since 2012. RASC-AL teams typically do not produce any working prototypes. DSSL provides opportunities for students to design, build, and prove feasibility of their concepts through Senior Design Projects.

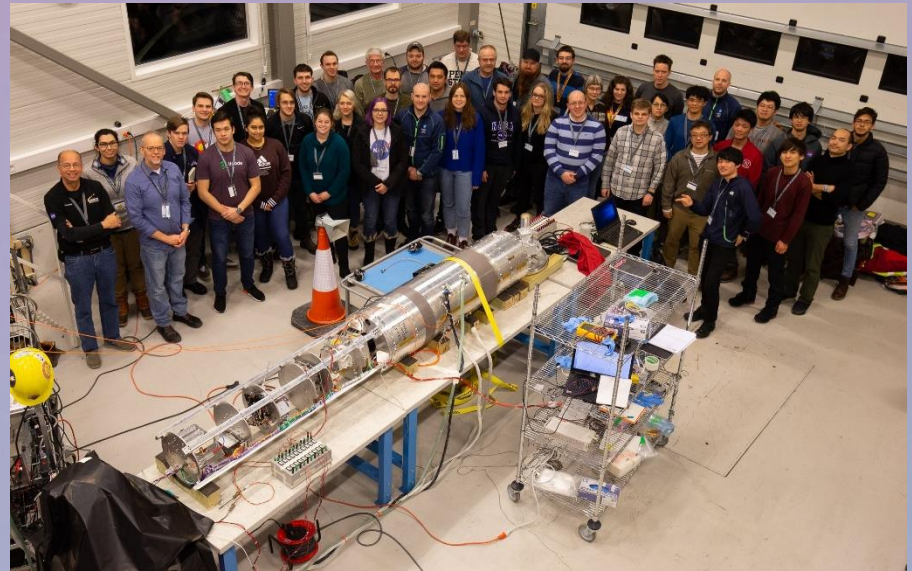


At Penn State - University Park, the Student Space Programs Laboratory (SSPL), led by Dr. Sven Bilen (engineering) coordinates student space projects and provides opportunities for students to participate in the systems engineering process through four interlinked programs: Flight, Technology and Mission Development, Infrastructure Development, and Education and Outreach.

SSPL completed two recent flight projects:

- the OSIRIS-3U (Orbital Satellite for Investigating the Response of the Ionosphere to Stimulation and Space Weather) CubeSat mission in November 2017 as part of NASA's CubeSat Launch Initiative; and
- the G-CHASER Student Rocket, from spring 2017 through spring 2019 as part of an international research campaign to study the cusp of Earth's magnetic field.

SSPL is a collaborator on Michigan's MiTEE (Miniature Tether Electrodynamics Experiment) mission through fall 2020 and will serve as a ground-station node during a planned launch in fall 2019.



- West Chester University of PA – Dr. Karen Schwarz (Earth & space science) “Increasing Student Interest in STEM through Formal Research Opportunities”

Research includes use of drones to study weather and atmospheric dynamics and monitor ground subsidence and unexploded ordnance, supercomputer modeling of mass-loss around magnetic massive stars, linking NASA data and imagery to flood risk management.



*Martin Helmke, geology professor in West Chester University's department of Earth and Space Sciences, watches a first-year student operate a drone during a project to map a hillside.*

*Bill Rettew/MediaNewsGroup The Mercury*

- Carnegie Mellon University – Dr. Stephen Garoff (physics) “Undergraduate Summer Research Internship Program”

The primary goal of this program is to match qualified students as early as possible in their academic careers with junior faculty, prioritizing both student and faculty from groups underrepresented in STEM disciplines.



- California University of PA – Dr. Thomas Mueller (geography)

“Earth Sciences: Tools, Education & Collaboration”

Undergraduates learn how to use tools such as spectrophotometers during field research and geochemistry lab work then present their research projects in academic and public sessions.

- Cheyney University of PA – Dr. Sakkar Eva (physics)

“STEM Undergraduate Research Program”

Undergraduate students are offered summer internships in university and professional research labs. Additional opportunities are offered related to the university’s new planetarium.

- Franklin & Marshall College – Dr. Fronefield Crawford (astronomy)

“Undergraduate Research: NANOSTars Program”

Undergraduate students participate as Student Teams of Astrophysics Researchers with members of the NANOGrav (North American Nanohertz Observatory for Gravitational Waves) Physics Frontiers Center, a collaboration of scientists working to detect and study very low-frequency gravitational waves.

- Gettysburg College— Dr. Jacquelynne Milingo (physics)

“NURO: Undergraduate Research in Astronomy”

As one of 12 members of the National Undergraduate Research Observatory (NURO), Gettysburg undergraduates who are interested in STEM fields can gain experience using a professional observing site.

- Lincoln University – Dr. Robert Langley (chemistry & physics)

“Undergraduate Research: Environmental Science Program”

Undergraduate students are offered opportunities to experience authentic hands-on research and explore careers in environmental science.

- University of Pittsburgh – Dr. David Turnshek (physics & astronomy)

“Undergraduate Research: NASA Science Mission Directorate topics”

Undergraduate students compete to develop research projects based on NASA SMD topics of interest and work directly with faculty. Emphasis is on understanding how the Universe works.





- Current program details:
- Spring and fall semesters 2019
- 51 student interns received \$575/semester (\$1,150 total)
- More than 50 labs offer WMF experiences from eight PSU - University Park colleges: Agricultural Sciences, Earth and Mineral Sciences, Eberly College of Science, Engineering, Education, Health & Human Development, Information Sciences & Technology, Liberal Arts

## **WISER**

**Women in Science and Engineering Research**

## **MURE**

**Minority Undergraduate Research Experience**

## **FURP**

**First-year Undergraduate Research Program  
(open to all first-year students)**